

A multi-year look at

# MATERNAL MORTALITY IN MISSOURI

2018-2020 Pregnancy-Associated  
Mortality Review

*Published 2023*



Pregnancy-Associated Mortality Review

## **Acknowledgments**

### **Missouri Department of Health and Senior Services (DHSS) Staff**

Paula Nickelson – Director, Department of Health and Senior Services  
Sarah Ehrhard Reid, MSW – Chief, Office on Women's Health  
Ashlie Otto, RN, BSN – Coordinator, PAMR Program  
Crystal Schollmeyer, RN, BSN – Abstractor, PAMR Program  
Daniel Quay, MA – Senior Research/Data Analyst, PAMR Program  
Karen Harbert, MPH – Lead Maternal-Child Health (MCH) Epidemiologist  
Martha Smith, MSN, RN, LNHA – Title V MCH Director

### **Pregnancy Associated Mortality Review Board – 2020 Case Reviews**

Karen Florio, DO, MPH, FACOG – Maternal-Fetal Medicine (MFM), University of Missouri, Columbia, Chair  
Traci Johnson, MD, FACOG – MFM, University Health, Kansas City, Chair-Elect  
Kimberly Brandt, DO – Perinatal Psychiatry, Mercy Hospital, St. Louis  
Ginger Breedlove, PhD, CNM, APRN, FACNM, FAAN – Founder/Principle Consultant  
Grow Midwives, LLC  
Katherine Campbell, BSN, RN – Kansas City Fetal-Infant Mortality Review, Nurture KC, Kansas City  
Captain Brent Drummond – Missouri State Highway Patrol, Patrol Records Division  
Marisha Frazier, MPH – Epidemiologist, University of Missouri, St. Louis  
Barbara Gleason, MSN, RN – Project Director RMOMS grant, Bootheel Perinatal Network, Cape Girardeau  
Mark Griesemer, DO, MHA, FACEP – Emergency Medicine, Mercy Hospital, Springfield  
Jennifer Hawn, DNP, RN WHNP-BC, RDMS Ob/Gyn – Missouri Baptist Medical Center, St. Louis  
George Hubbell, MS, MD – Ob/Gyn, Lake Ozark  
Daniel Jackson, MD, MS, FACOG – Maternal-Fetal Medicine, Mercy Hospital, St. Louis  
Timothy Kling, MD, FACOG – Acting Medical Director, Department of Social Services, MO HealthNet  
Mistie Mills, MD, MHA – Ob/Gyn, University of Missouri, Columbia  
Keith Norton, MD – Forensic Pathology, Boone/Callaway County Medical Examiner's Office, University of Missouri, Columbia  
Patricia Norton, MD, MPH – Public Health, Columbia  
Roxane Rampersad, MD, MFM – Washington University School of Medicine, Barnes Jewish Hospital, St. Louis

Alison Williams, MBA-HCM, RN, BSN, CPHQ – Missouri Hospital Association,  
Missouri Perinatal Quality Collaborative

**Consultant – 2020 Case Reviews**

Brenda Schell – Missouri Public Health Analyst, Overdose Response Strategy,  
Midwest High Intensity Drug Trafficking Areas (HIDTA)

**Other Report Contributors**

Evan Mobley, MS – Research Manager, DHSS

Lisa Giles, MPH – Epidemiologist, DHSS

Chelsea Fife, BA – Senior Research/Data Analyst, DHSS

LeighAnna Bennett, MPH – Research/Data Analyst, DHSS

Carol Bontempo, MA – Research/Data Analyst, DHSS

**For more information, please visit our website:**

<https://health.mo.gov/data/pamr/index.php>.

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## **Dedication**

The Missouri Department of Health and Senior Services (DHSS) would like to express our sincerest gratitude to the Pregnancy Associated Mortality Review (PAMR) Board for their commitment to reviewing each and every maternal mortality and for making maternal health a priority. DHSS extends gratitude to our partners and those who are working to implement recommendations to prevent maternal mortality. DHSS and the PAMR Board would like to convey our deepest sympathies to the children, partners, parents and all those who love and miss the 210 women who died while pregnant, or within one year of pregnancy from 2018-2020. This report is dedicated to their memory, with the hope that we may bring meaning to what can often seem a senseless death. We will continue our efforts to understand the causes and contributing factors of maternal mortality in Missouri to prevent others from experiencing such a loss.



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## Executive Summary

Maternal mortality events, those where a mother dies during or shortly after pregnancy, are internationally viewed as an indicator to evaluate the overall health of a country, state or community. This report describes maternal mortality in Missouri from 2018-2020.

While it is vital to analyze these deaths on a yearly basis, the goal of this multi-year report is to provide a more comprehensive representation of maternal mortality in the state. DHSS identified deaths of Missouri residents that occurred when a woman was pregnant or within one year of pregnancy, and presented information regarding the pregnancy and death to the PAMR Board. The board performed a comprehensive review of these deaths. The board's findings and recommendations are summarized in this report, with the goal to prevent future instances of maternal mortality.

### Key Findings

An average of 70 Missouri women died while pregnant or within one year of pregnancy each year, with the highest number recorded in 2020 (85 deaths).

From 2018-2020 (210 deaths total):\*

- The pregnancy-related mortality ratio (PRMR) was 32 deaths per 100,000 live births, up from 25.2 deaths in the last multi-year report.
- The PRMR for Black women was three times the ratio of white women.
- Eighty-four percent of pregnancy-related deaths were determined to be preventable, which is nine percent higher than the last multi-year report.
- The greatest proportion (49%) of pregnancy-related deaths occurred between 43 days and one year after pregnancy.
- Mental health conditions, including substance use disorder (SUD), were the leading underlying cause of pregnancy-related deaths, followed by cardiovascular disease and then homicides.
- All pregnancy-related deaths due to mental health conditions, including SUD, were determined to be preventable.
- The number of suicide deaths doubled when comparing 2017-2019 with 2018-2020. This corresponded with an increase in the number of firearm deaths.
- Women residing in metropolitan counties were almost twice as likely to die a pregnancy-related death than those residing in rural counties.

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\* All statistics include women who died while pregnant or within one year of pregnancy unless otherwise specified.

- Women residing in rural counties had the highest ratio of pregnancy-associated, not related deaths (PANR), deaths at 68 deaths per 100,000 live births.
- The ratio of PANR deaths for women with a Medicaid-covered pregnancy was more than 10 times greater than the ratio for those with private insurance.

## **Key Recommendations**

Below and within the body of this report are the board's recommendations made during 2018-2020 case reviews on what could prevent maternal mortality. It is important to note that the recommendations may not reflect policy changes or implementation efforts. The key recommendations were those most frequently identified among board members. To help highlight who can take action, they have been separated by decision-makers.

- **The Missouri legislature should:**
  - Provide funding for a statewide Perinatal Quality Collaborative (PQC) by 2023.
  - Establish and fund a statewide Perinatal Psychiatry Access Program to aid healthcare providers in providing evidence-based mental health care, including SUD treatment to Missouri women.
  - Extend Medicaid coverage to one year postpartum for all conditions (including medical, mental health and SUD), even if the woman did not start treatment prior to delivery, to aid women whose condition is exacerbated in the postpartum period.
  - Fund Medicaid expansion by 2023.
  - Increase the seat belt violation fine from \$10 to \$60 by 2024.
  - Pass a state primary enforcement seat belt law that covers all occupants, regardless of where they are sitting in the vehicle by 2024.
- **All healthcare providers should:**
  - Perform a full assessment for depression and anxiety utilizing a standardized, validated tool at least once prenatally and at least once during the comprehensive postpartum visit, adding additional screenings as indicated.
  - Perform universal screening for SUD utilizing a standardized, validated tool on every patient at least once prenatally and at least once during the comprehensive postpartum visit, adding additional screenings as indicated.
  - Make referrals to mental health professionals, social workers, community health workers and SUD treatment programs as appropriate.
  - Obtain further education regarding screening, referral and treatment of:
    - Mental health conditions during and after pregnancy.
    - SUD during and after pregnancy.
    - Cardiovascular disorders associated with pregnancy (i.e. peripartum cardiomyopathy, hypertensive disorders of pregnancy, etc.).

- **Healthcare facilities should:**
  - Use social work and community health workers, during pregnancy and postpartum, to increase continuity of care for referrals, follow-up care, communication and social determinants of health.
  - Standardize practices and procedures across the healthcare system through utilization of quality improvement practices such as Alliance for Innovation on Maternal Health (AIM) patient safety bundles.
- **All healthcare staff should:**
  - Complete trainings on trauma-informed care at least annually.
  - Complete implicit bias training at least annually.
- **Community-based organizations (CBOs) should:**
  - Collaborate with health care facilities and providers to reduce stigma surrounding maternal mental health and SUD, and provide assistance to resources for these conditions.
  - Collaborate with health care facilities and providers to educate their community on domestic violence (DV) and intimate partner violence (IPV), and provide resources and assistance for women affected by DV or IPV.
  - Empower pregnant and postpartum women to use doula services, home visiting and/or community health workers, which has been shown to increase healthcare utilization.
  - Provide outreach to educate women on preconception health and early and consistent prenatal care to optimize a woman's health.
- **All medical death certifiers should:** ensure an autopsy and toxicology are completed on a woman who has been pregnant within the last year.
- **Government agencies, in partnership with financial institutions and philanthropic funders should:** invest in urban infrastructure (grocery stores, medical care access, banks and playgrounds) to increase maternal health outcomes and decrease violence.
- **State agencies, healthcare providers, CBOs and families should:** increase public awareness of the importance of seat belt safety during the perinatal period.
- **State agencies, in partnership with CBOs, should:** implement community violence intervention (CVI) programs with a focus on reducing homicides to pregnant and postpartum women.

### **A Word of Caution**

*When aggregating three years of data, the population size for this analysis is small and the results should be used with caution. Having a small population size creates an increased likelihood of the results being skewed; meaning some effects may be exaggerated, while others may remain hidden. This effect may be increased when data is missing. Working with small population sizes also prevents more complex statistical*



*analysis that would provide additional insights and may help reveal causes and not just correlations. The PAMR Board makes their recommendations with this in mind, seeking to not only lower ratios of maternal mortality but to improve the reproductive health outcomes of women overall.*

## Definitions

As depicted in Figure 1, a pregnancy-associated death is an umbrella term for all maternal mortality. Beneath that umbrella are pregnancy-related deaths and pregnancy-associated, but not related deaths.

**Pregnancy-associated death:** When a Missouri resident dies while pregnant, during delivery or within one year postpartum regardless of the cause. Pregnancy-associated deaths can be further placed into one of three categories:

- **Pregnancy-related death:** The death of a woman occurred during or within one year of pregnancy, from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy.
- **Pregnancy-associated, but not related death (PANR):** The death of a woman during or within one year of pregnancy, from a cause that is not related to pregnancy (i.e. pregnant woman dies in earthquake).
- **Pregnancy-associated but unable to determine relatedness:** Instances when the board was unable to determine if a death was pregnancy-related or PANR. In previous reports, this category was counted as a PANR death due to small population size. For the sake of brevity, this is referred to as *Unable to Determine* in the charts and figures in the report.



**Maternal mortality:** Throughout this report, maternal mortality is used to describe deaths during pregnancy, childbirth and the postpartum period up to 365 days from the end of pregnancy.

## Maternal Health

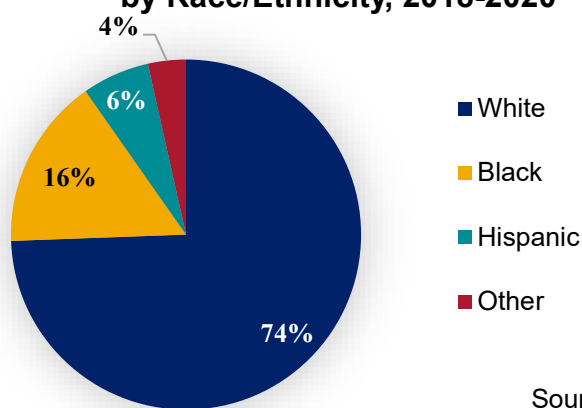
A woman's health influences the well-being of her children, family and community. Preconception health, or health prior to becoming pregnant, is vitally important and can dramatically impact health outcomes throughout pregnancy and postpartum. However, during the perinatal period, women often engage more with the healthcare system. For this reason, pregnancy provides an opportunity to identify and manage underlying

chronic diseases, such as obesity, hypertension, diabetes, asthma and depression. Healthcare providers also have an increased opportunity during this time to connect patients with available resources and services in their community to address needs related to social determinants of health (SDOH).

## Birthing Demographics in Missouri

Missouri is home to a population of 6,151,548, including 1,994,890 women of reproductive age (defined as 10-60 years old) based on 2020 estimates.<sup>1</sup> Missouri women had an average of 71,554 live births per year.<sup>2</sup> Non-Hispanic white women

**Figure 2: Percent of MO Live Births by Race/Ethnicity, 2018-2020**



Source:  
DHSS-MOPHIMS-Birth MICA

represented 74% of these births, while Non-Hispanic Black women represented 16% and Hispanic women of any race represented 6%. Women, who did not fall into any of the above categories, including Asian, American Indian, Pacific Islander and other groups, represented 4% (Fig. 2). Compared with the population of women of childbearing age in Missouri at this time, a lower percentage of live births were to Black and white

women and a greater percentage of live births were to Hispanic women.

## Statewide Challenges

**Prenatal Care.** There are a number of challenges likely to influence maternal morbidity and mortality trends in Missouri. One challenge is the low rate of timely initiation of prenatal care. The Healthy People 2030 target for the proportion of pregnant women who receive early and adequate prenatal care is 80.5%, whereas 76.5% of Missouri mothers received early and adequate prenatal care. Prenatal care utilization offers medical providers an opportunity for early identification and intervention regarding risk factors that affect maternal mortality.

- For pregnancy-related deaths, 63% initiated prenatal care in the first trimester, 23% in the second trimester and 13% had no prenatal care.

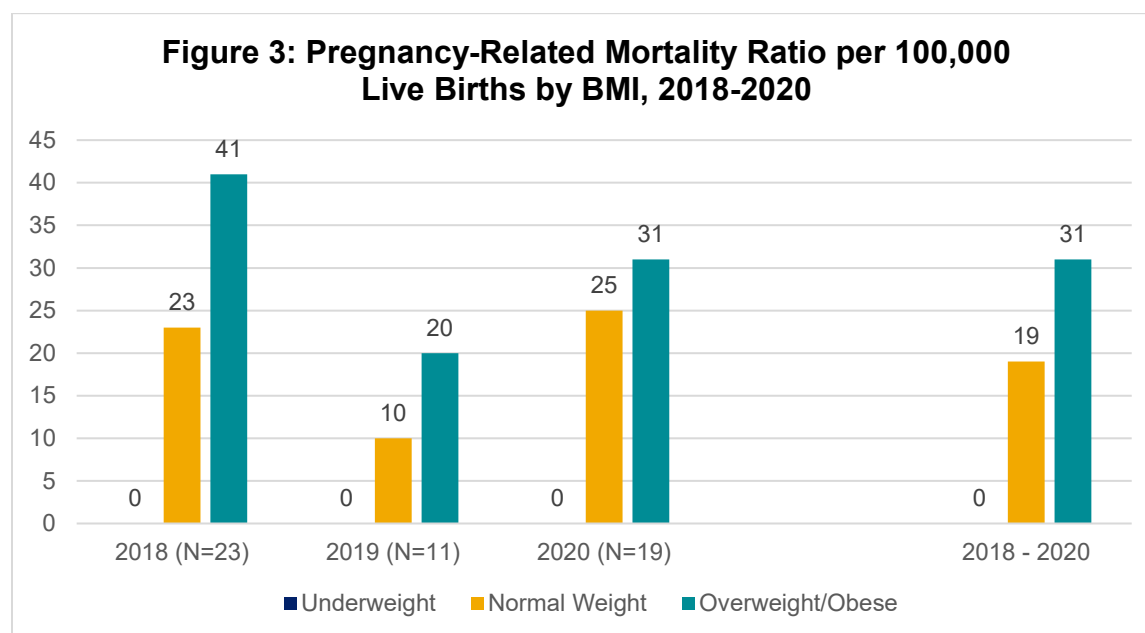
CBOs should provide outreach to educate women on preconception health and early and consistent prenatal care to optimize a woman's health.

**Smoking.** Smoking during pregnancy has significant perinatal risks such as fetal growth restriction, preterm labor, ectopic pregnancy and decreased maternal thyroid function, among many others.<sup>3</sup> While tobacco use may not have been a direct contributor to death, the negative health impacts of smoking on a person are well-documented. As such, the PAMR program tracks tobacco use regardless of whether it was considered a contributing factor.

- 44% of pregnancy-related deaths used tobacco.
- 50% of pregnancy-associated deaths used tobacco.

## Pregnancy and Chronic Health Conditions

**Obesity.** A number of conditions can result in health complications during pregnancy for both the mother and the child. One key condition is obesity, which is a chronic disease. Obesity is associated with an increased risk for nearly all pregnancy complications and with a higher incidence of congenital anomalies.<sup>4</sup> In addition to increased complications during pregnancy, the ratio of pregnancy-related deaths for women with obesity is significantly higher than for any other weight group (Fig. 3).



Obesity continues to burden the state of Missouri. The Healthy People 2023 target for proportion of women who have a healthy weight before pregnancy is 47.1% while Missouri comparatively is at 25.3% according to 2020 healthy-weight data.

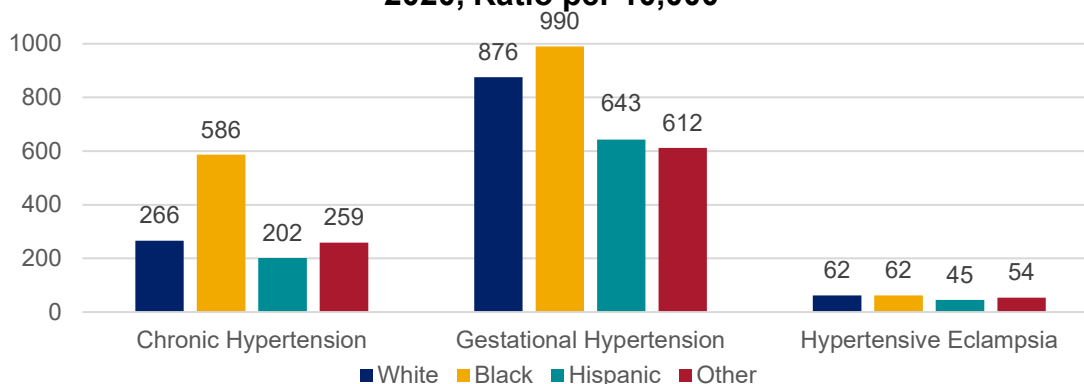
- The PRMR was **highest** among women who were **overweight/obese** with 31 deaths per 100,000 live births.

This ratio was more than **1.5 times** the ratio of women with a healthy weight. This disparity was not found to be statistically significant.<sup>†</sup>

**Hypertension.** A leading cause of maternal mortality is hypertensive disorders of pregnancy (HDP), occurring in 12-22% of pregnancies.<sup>5</sup> They are estimated to also be responsible for 17% of maternal mortality events nationwide. HDP may be subdivided into chronic hypertension, preeclampsia/eclampsia, preeclampsia superimposed on chronic hypertension, and gestational hypertension. If not managed, all of these could potentially become medical emergencies.

In Missouri, there were 6,691 instances of chronic hypertension in pregnancy, 18,610 instances of gestational hypertension and 1,294 instances of eclampsia.<sup>6</sup> Black mothers had the highest rates of these three forms of hypertension as listed on the Missouri certificate.<sup>‡</sup> (Fig. 4). There is also an association between those who had hypertension and obesity.. Chronic hypertension in pregnancy and eclampsia was most frequent among those aged 30-39 years old. Gestational hypertension most frequently occurred in women between 20-29 years old.

**Figure 4: Hypertension During Pregnancy by Race 2018-2020, Ratio per 10,000**



- **Approximately 16% of pregnancy-related deaths had a form of hypertension diagnosis.** This data is pulled from birth and fetal death certificates and may be an underestimate of the true prevalence.

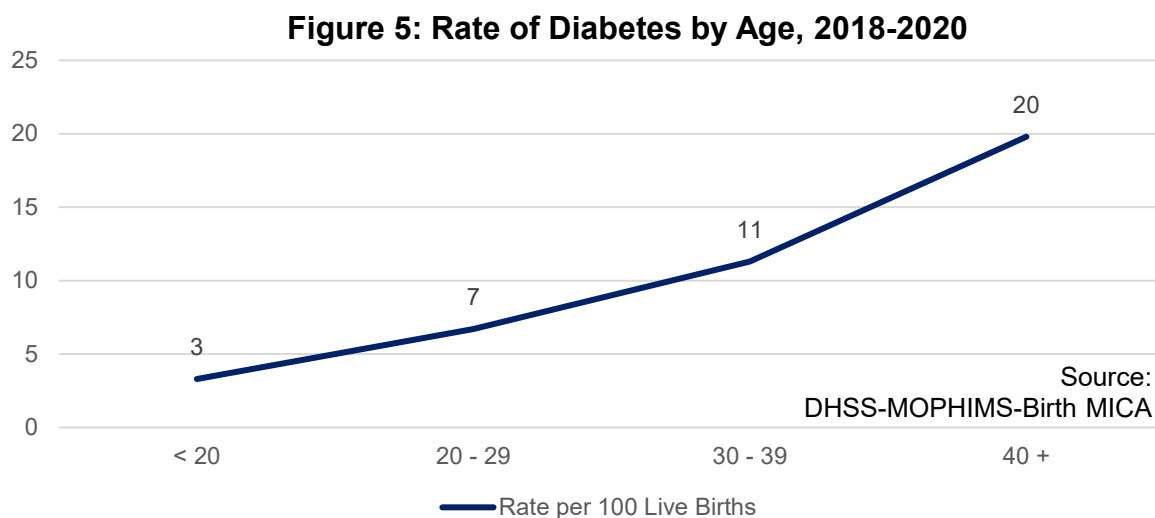
**Diabetes.** During pregnancy, any form of diabetes may negatively impact the health of women and their babies.<sup>7</sup> To alleviate adverse outcomes, preconception care (healthcare prior to pregnancy) and prenatal care are vital components to ensuring a

<sup>†</sup> Statistical significance was determined at the ( $p \leq 0.05$ ) level using Chi-Square testing.

<sup>‡</sup> The Missouri birth certificate terminology for HDP differs (Fig. 4) from current HDP terminology according to ACOG.

healthy mother and baby. Providers can help monitor blood sugar and make recommendations specific to each person for best managing this condition. As shown in Figure 5, as age increases, so does the rate of diabetes.<sup>8</sup>

- 6% of pregnancy-related deaths had gestational diabetes.

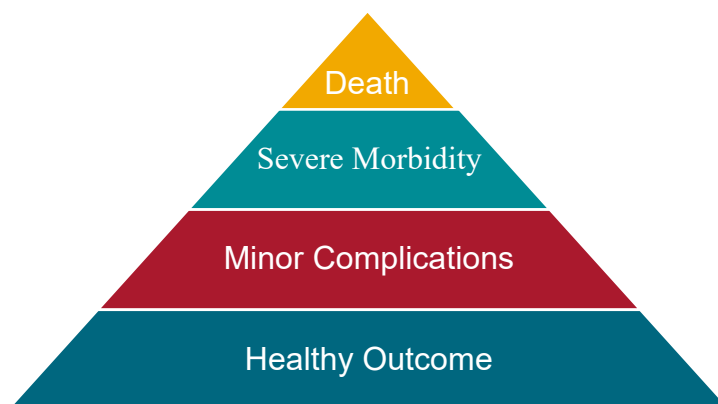


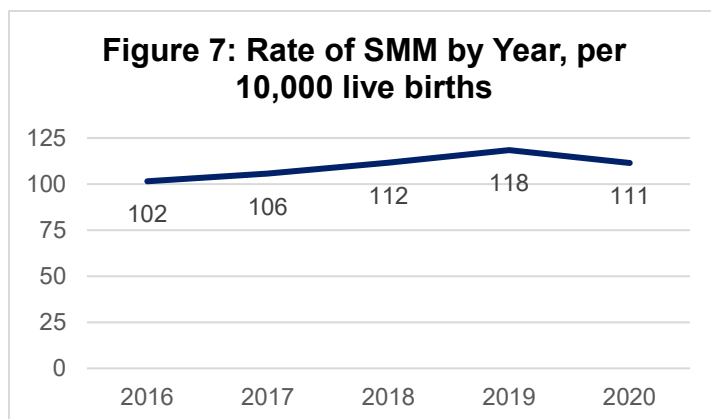
## Maternal Morbidity and Mortality

There is a continuum of birth outcomes and it is important to highlight the events that can lead to maternal mortality. The most common experience is a healthy outcome, or a birth with only minor complications.

In general, the more severe the outcome, the less frequently it occurs (Fig. 6). Maternal morbidity, including severe maternal morbidity (SMM) is an overarching term for unexpected negative outcomes of labor and delivery that result in significant short-term or long-term consequences to a woman's health. These acute conditions may include, but are not limited to, blood transfusions, renal failure and hysterectomy.<sup>9</sup>

**Figure 6: Maternal Health Outcome Continuum**



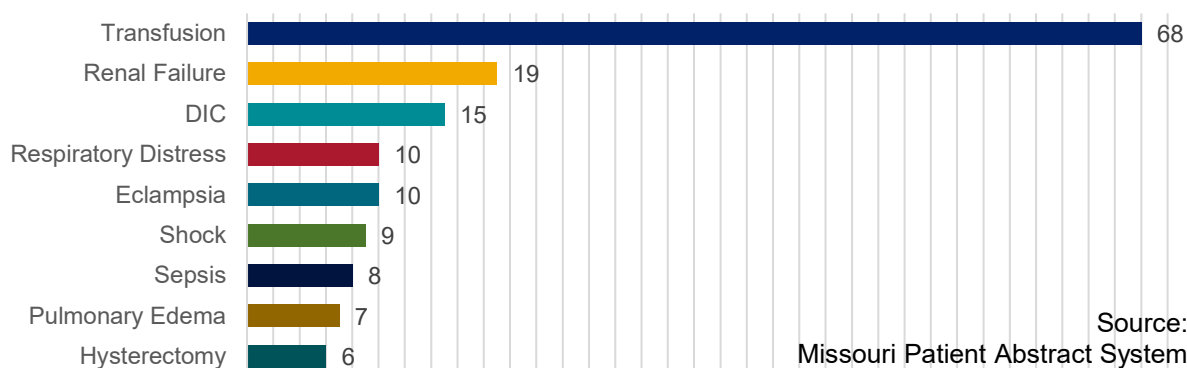


Those most at risk for SMM are women who were over age 34, were carrying multiples,<sup>10</sup> had certain coexisting medical conditions,<sup>11</sup> or had a prior cesarean delivery.<sup>12</sup> From 2018-2020 there were 2,444 instances of SMM in Missouri for an overall rate of 114 per 10,000 live births.<sup>§</sup> As shown in Figure 7, the annual rate of SMM has consistently

been greater than 100 instances per 10,000 live births.

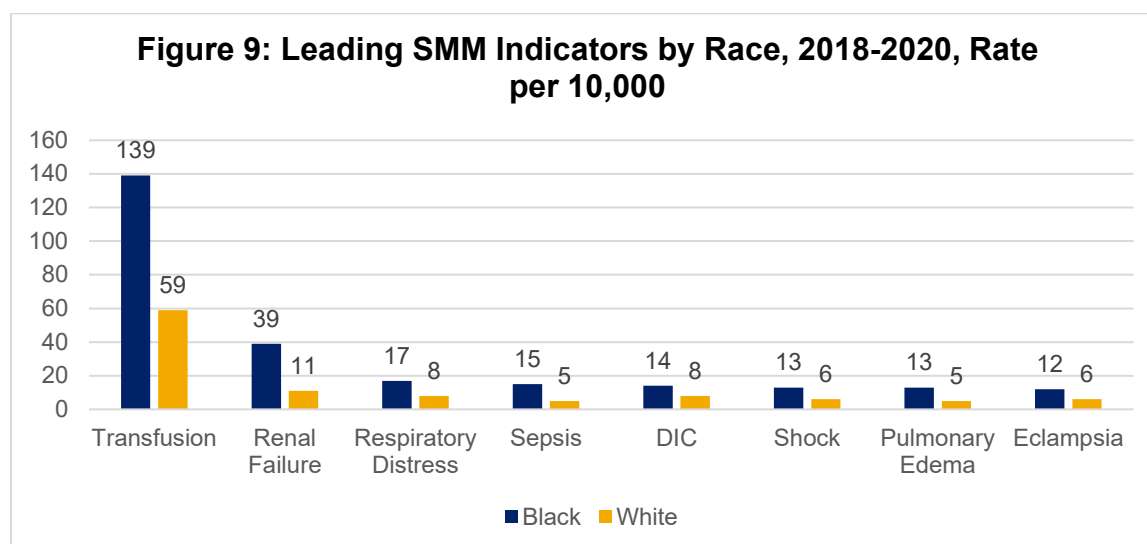
Figure 8 provides the rates for leading indicators of SMM. The most common indicator for SMM is a transfusion. Transfusions occur at a rate of 68 per 10,000 live births. The rate of transfusions for Black women was 139 per 10,000 live births. This is more than double the rate for white women (59). Renal failure was the second most common indicator of SMM with a rate of 19 per 10,000 live births.

**Figure 8: Additional Indicators of SMM, 2018-2020, Rate per 10,000**

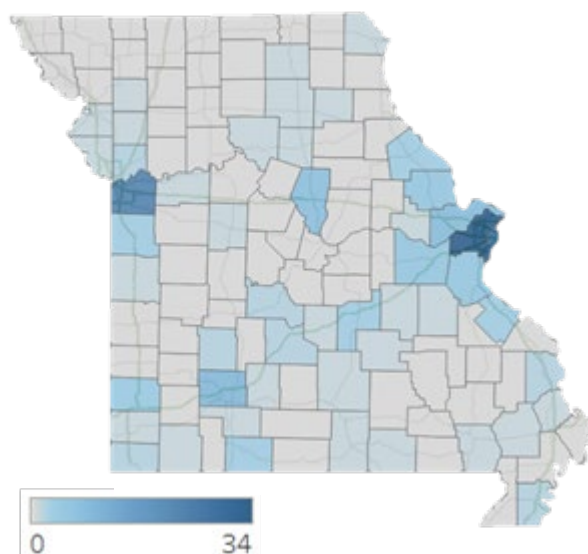


However, the most common indicators of SMM after transfusions vary by race (Fig. 9). For white mothers, the second highest rate after transfusion was renal failure with a rate of 11 per 10,000 live births, followed by disseminated intravascular coagulation (DIC) (8) and respiratory distress (8). This was followed by eclampsia (6) and shock (6). For Black mothers, the second highest rate after transfusion was renal failure with a rate of 39 per 10,000 live births, respiratory distress (17), sepsis (15), DIC (14), shock (13) and pulmonary edema (13).

<sup>§</sup> This data is based on Missouri residents only. A list of indicators utilized is available at <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm>.



**Figure 10: Map of All Pregnancy-Associated Deaths by Residence, 2018-2020**



The most severe outcome is death during or after pregnancy. This report focuses on these extreme outcomes and seeks to emphasize opportunities to improve maternal health and healthcare. As shown in Figure 10, pregnancy-associated deaths most frequently occurred among residents of metropolitan counties. As such, further investigation is warranted to understand the relationship between access to care and maternal morbidity and pregnancy-associated death overall. The map presented utilizes the total number of deaths rather than the ratio. This is because stable ratios are

unable to be calculated for the majority of counties due to the small numbers involved, particularly in rural counties.

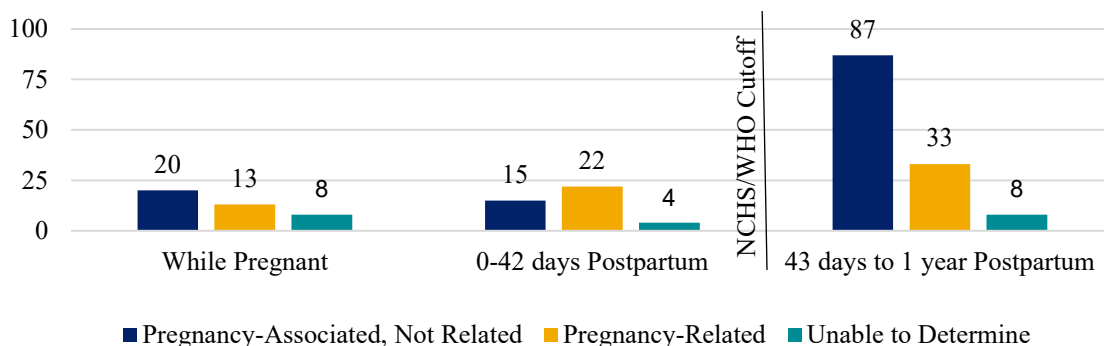
## Surveillance of Maternal Mortality

**Surveillance Timing.** Timing of death influences whether a case is identified as a possible instance of maternal mortality. The CDC National Center for Health Statistics (NCHS) and the World Health Organization (WHO) identify deaths that occur during pregnancy, or within 42 days postpartum, as possible cases of maternal death. However, the PAMR program differs in terminology and duration by utilizing the term



pregnancy-associated as defined above for case identification and continues beyond 42 days postpartum to one year. If the NCHS/WHO standard were used, 33 pregnancy-related cases in Missouri would not have been identified (Fig. 11).

**Figure 11: Timing of Death, 2018-2020**

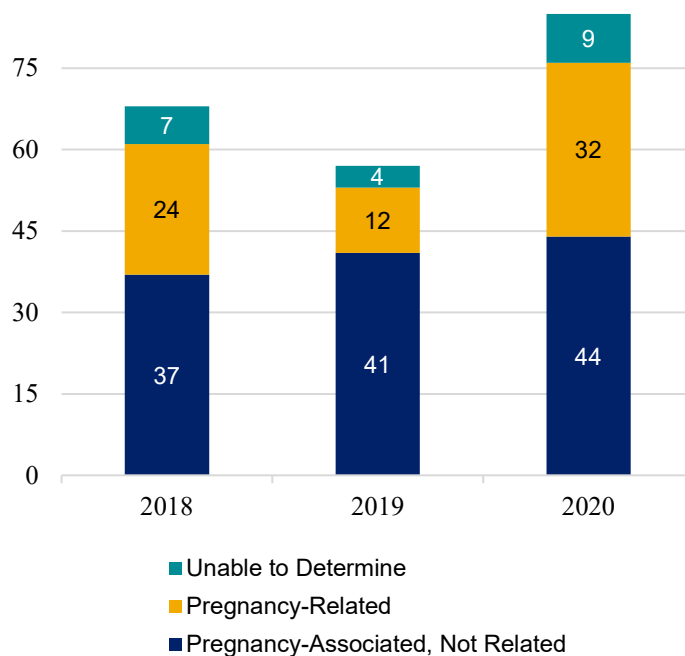


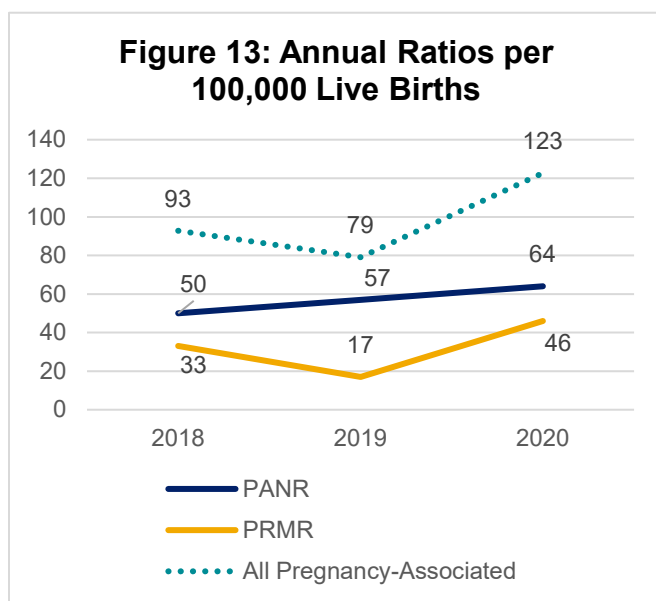
## PAMR Board Determinations

During 2020, the number of maternal mortality cases increased in Missouri and nationwide, as represented in Figure 12. The PAMR Board collaboratively reviewed all pregnancy-associated cases to determine pregnancy-relatedness, the cause and contributing factors of death, and provided recommendations for improved outcomes.

Figure 12 shows the board determinations regarding relatedness by year, while Figure 13 breaks down the differences in ratios annually from 2018-2020. For a more detailed look at the PAMR process, consult Appendix A and Appendix B.

**Figure 12: Number of Pregnancy Associated Deaths, Missouri 2018-2020**





- 2020 saw an increase not only in the number of cases overall, but also in the PRMR.
- PANR cases and ratios have shown steady increases, but are more stable.
- Looking at each of these demonstrates the variability in the number of cases each year and how that variability can impact the ratios being discussed.

From 2018-2020, 32% of cases were pregnancy-related, translating to a PRMR of 32 deaths per 100,000 live

births. Meanwhile, the majority of cases (59%) were PANR. A further 10% of cases were pregnancy-associated, but it was not possible to determine whether the cases were pregnancy-related.

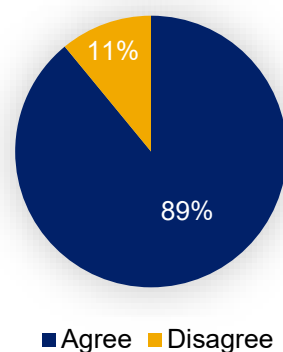
## Data Evaluation

The PAMR Board agreed with the underlying cause of death listed on the death certificate for the majority of pregnancy-associated cases (89%, Fig. 14). The PAMR Board disagreed with the cause of death only when the evidence was sufficient to justify disputing the information on the death certificate. In 23 cases, the PAMR Board disagreed with the cause of death; only 35% of these cases had an autopsy.

Of these 23 cases:

- **61%** were determined by the board to be **pregnancy-related**.
- **61%** were determined to have a **medical** underlying cause of death.
- **30%** were determined to have died of **cardiovascular disease**.
- **50%** died between **0 and 42 days postpartum**.

**Figure 14: Committee Agreement with Underlying Cause of Death Listed on Death Certificate, 2018-2020**



Medical death certifiers should ensure an autopsy and toxicology are completed on a woman who has been pregnant within the last year.

The PAMR Board could only make decisions based on the quality of information they received; their abilities were also limited by that same restriction. Every attempt was made to obtain records from healthcare providers and facilities, as well as coroners and medical examiners. However, toxicology screenings and autopsies were not always performed and additional information from the healthcare system was not always obtainable. For instance, a woman could have sought medical

treatment from a provider in another location, but details such as the name of the provider or clinic were not documented (e.g. “the patient was seen by a neurologist for headaches”).

The state should adopt a centralized medical record system.

Healthcare facilities should use social work and community health workers, during pregnancy and postpartum, to increase continuity of care for referrals, follow-up care, communication and social determinants of health.

## Pregnancy-Related Demographic Disparities

Comparing ratios helps determine the degree of disparity in health outcomes between different populations. However, these do not occur within a vacuum and fully exploring the mechanisms that drive each result in these disparate outcomes is beyond the scope of this annual report.

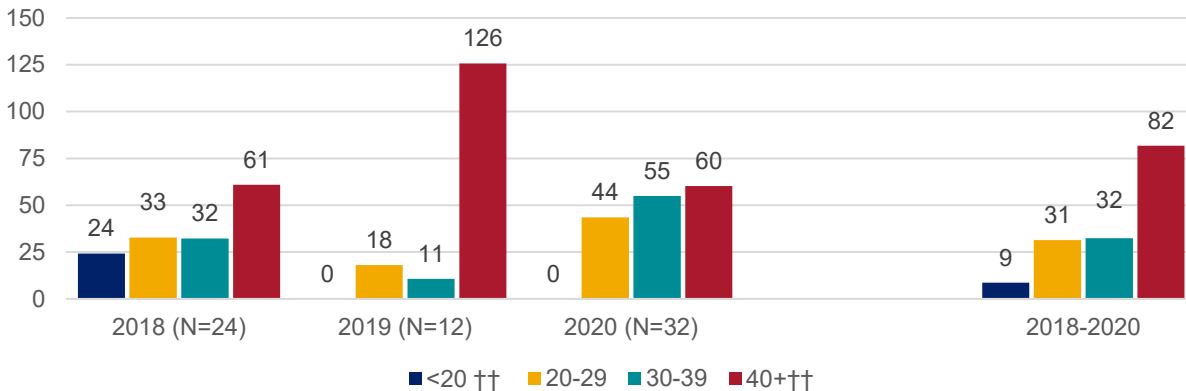
### Associations

#1 The ratio of pregnancy-related deaths for those who had a high school diploma or GED was **3.3 times higher** than for those who had obtained education beyond a high school diploma or GED.

#2 The ratio of pregnancy-related deaths was **2.5 times higher** for those who had a Medicaid-covered pregnancy compared with those who had private insurance.

#3 The ratio of pregnancy-related deaths for Black women was **3 times higher** than the ratio of deaths for white women.

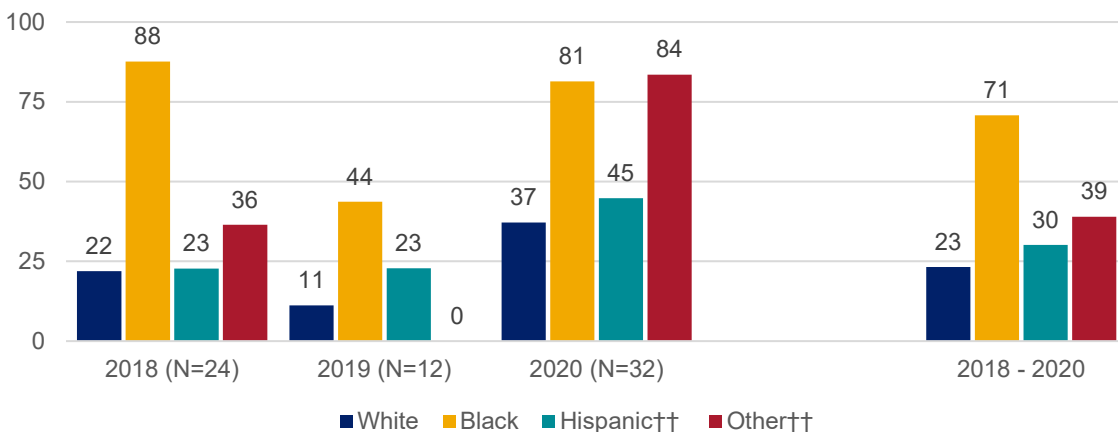
**Figure 15: Pregnancy-Related Mortality Ratio per 100,000 Live Births by Age**



From Figure 15, the PRMR is consistently highest in women 40 years old or older. However, due to the small population size, this is not a stable ratio. The aggregate ratios calculated are also unstable for ages < 20 and further analysis was not deemed feasible at this time due to the small numbers. Despite the unstable rates that appear, the disparity in outcomes based on age was statistically significant.

- Women aged **40+** had a pregnancy-related death ratio **2.6 times higher** than women between 20 and 29 years old. However, this ratio is unstable and should be used cautiously.

**Figure 16: Pregnancy-Related Mortality Ratio per 100,000 Live Births by Race/Ethnicity**



Pregnancy-related mortality is highest among Black women with a ratio of 71 deaths per 100,000 live births (Fig. 16). This disparity persists across all timeframes. The PRMR for Hispanic women and other minorities is unstable and should be interpreted with caution

\*\* Ratios are unstable due to small sample size and extreme caution should be taken when using this data.

due to extremely low population size. The disparity in racial outcomes was statistically significant.

- **Black women** experienced pregnancy-related death at a rate **3 times higher** than white women.

**Figure 17: Pregnancy-Related Mortality Ratio per 100,000 Live Births by Education Level**

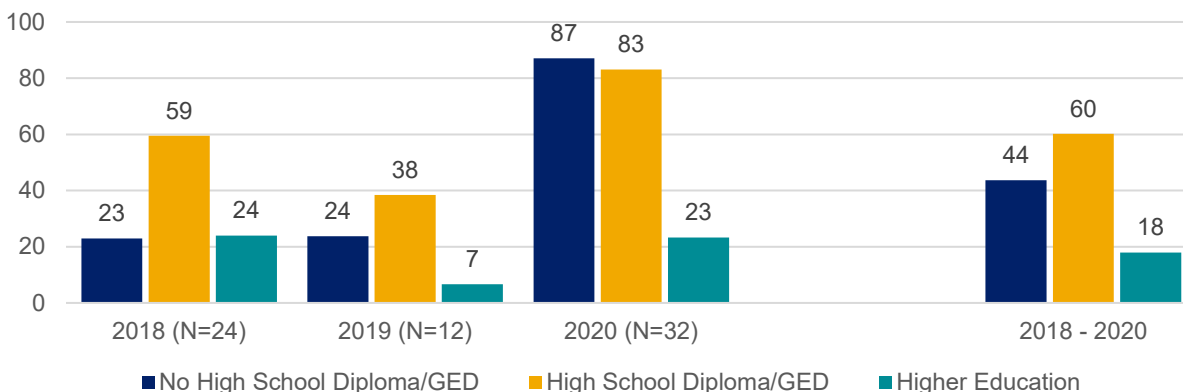
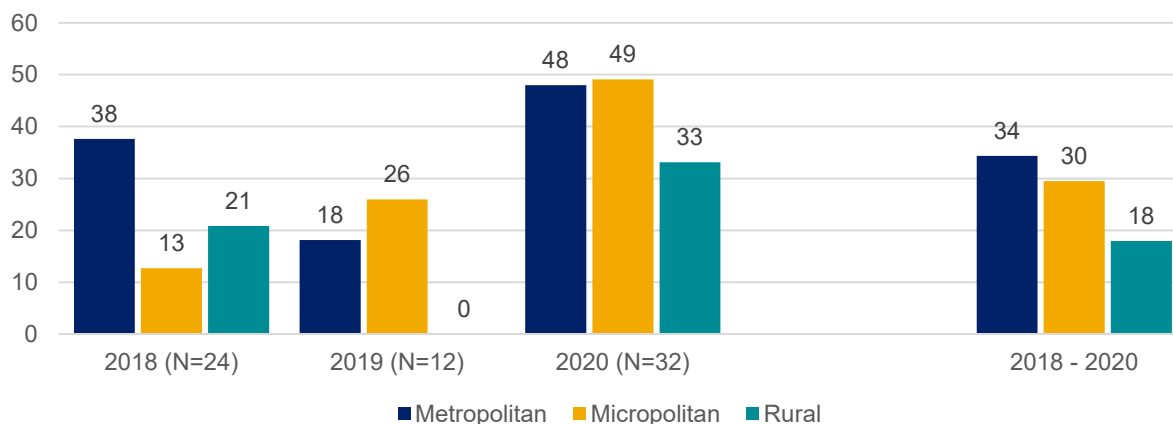


Figure 17 illustrates some of the problems in relying on a single year for the examination of disparities, as the 2020 ratios are very different from the 2018-2020 aggregate ratios. The differences between education levels were statistically significant.

- Women with a **higher education level** had a ratio of pregnancy-related death **3.3 times lower** than those who had obtained a high school diploma/GED.

**Figure 18: Pregnancy-Related Mortality Ratio per 100,000 Live Births by Residential Status**

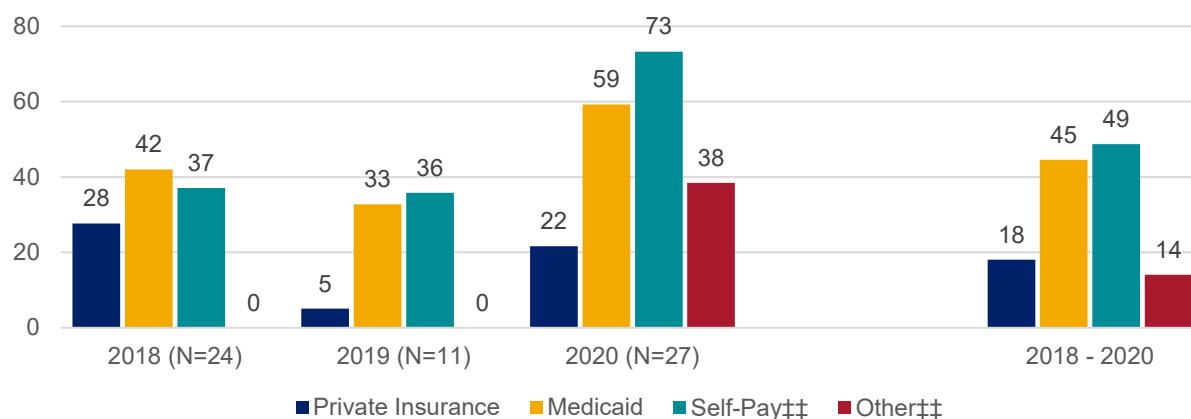


The largest group of births occurred to women in metropolitan counties. The PRMR for rural women was only stable when using the aggregate and, as such, should still be

treated with caution due to low population sizes (Fig. 18). Despite the low population size for rural women, the disparities based on residential status were statistically significant.

- Women residing in **metropolitan** counties had a pregnancy-related death ratio **2 times higher** than those residing in rural counties.

**Figure 19: Pregnancy-Related Mortality Ratio per 100,000 Live Births by Payment Type**



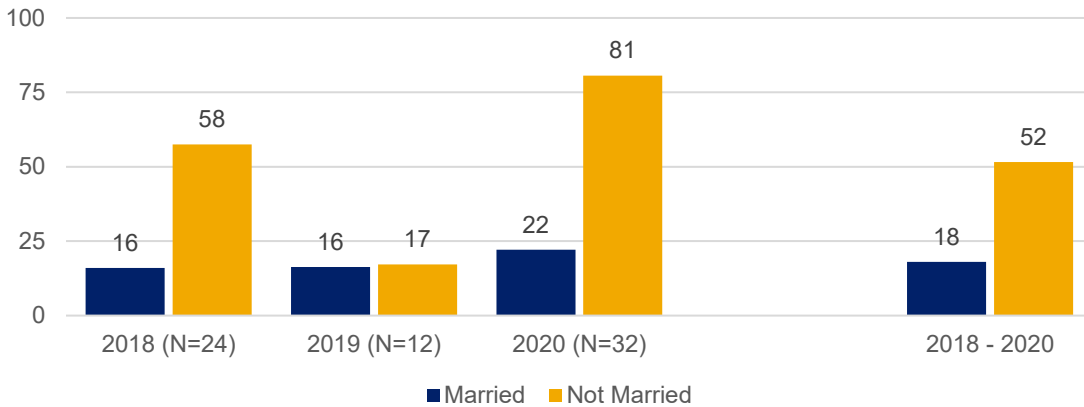
The highest stable PRMR was among those who had a Medicaid-covered pregnancy with a rate of 45 deaths per 100,000 live births (Fig. 19). Those with an unknown insurance status were excluded. Other may include, but is not limited to programs such as Tri-Care, Indian Health Services, and Christian Medical Health Sharing groups. The difference between groups for pregnancy-related deaths was found to be statistically significant despite the small populations for self-pay and the other category being too small to report stable ratios.

- Women with a **Medicaid**-covered pregnancy had a PRMR **2.5 times higher** than those with private insurance.

As shown below in Figure 20, the aggregate ratio of not-married women is more than 2.9 times the ratio for married women, who made up the greatest percentage of live births in Missouri from 2018-2020. For this report, marital status was based on marital status at time of death. Additionally, women who were separated but still legally married at time of death were treated as not married. This disparity was found to be statistically significant.

†† Ratios are unstable due to small sample size and extreme caution should be taken when using this data.

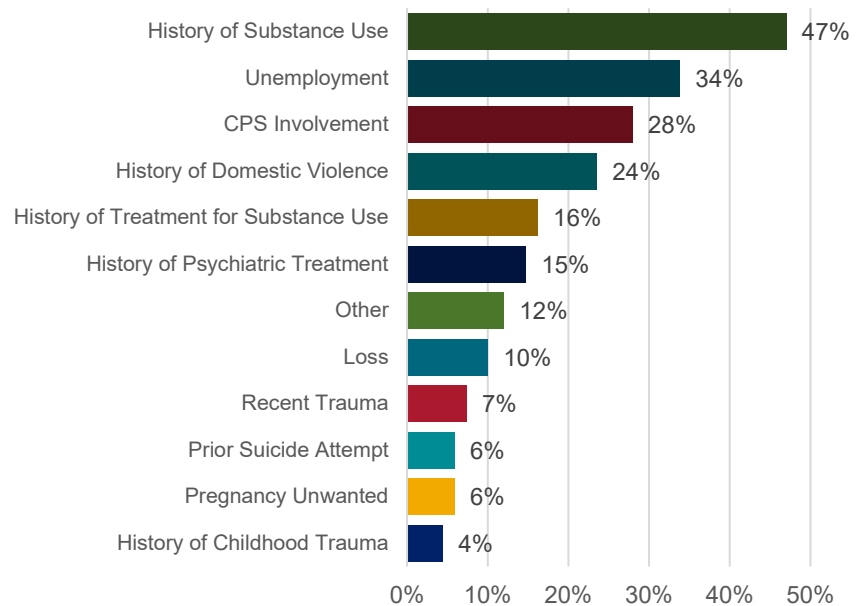
**Figure 20: Pregnancy-Related Mortality Ratio per 100,000 Live Births by Marital Status**



- The PRMR was **highest** among women who were not married with a ratio of **52** deaths per 100,000 live births (Fig. 20).

The PAMR program looks at factors in one's course of life, such as social and emotional stressors, that add context around a pregnancy-associated death. Beyond the demographic analyses reported above, women whose deaths were pregnancy-related had documentation in the records obtained of undergoing social and emotional distress (Fig. 21).

**Figure 21: Pregnancy-Related Social and Emotional Stressors, 2018-2020**



- 47%** had a history of substance use (alcohol, opioids, etc.).
- Only **16%** had a history of **treatment** for substance use.
- 24%** had a history of **DV or IPV**.
- More than **one-third (34%)** had experienced unemployment.
- More than **1 in 4 (28%)** had Child Protective Services (CPS) involvement.

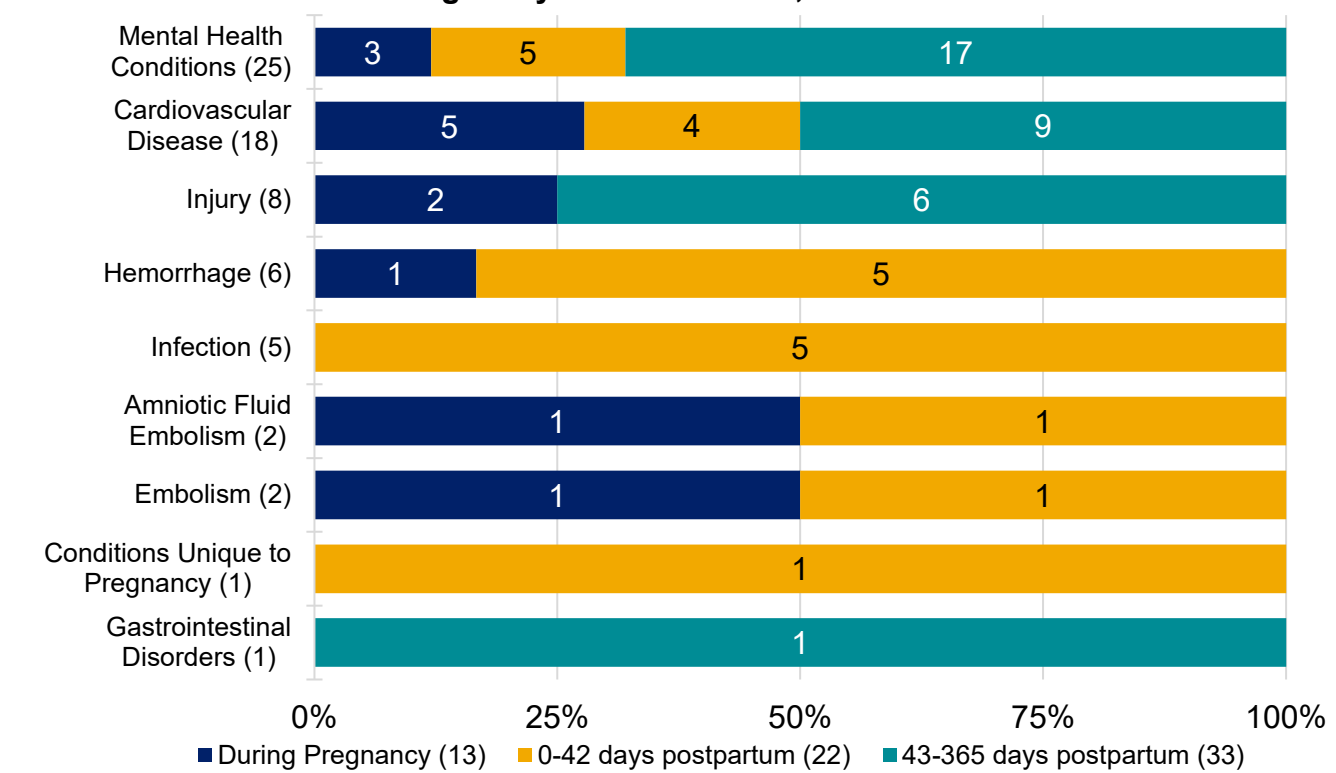
The PAMR Board acknowledges that some of these indicators are likely underreported for various reasons and/or not available in medical records. The Board seeks to better understand all social influencers of health for future maternal mortality prevention efforts.

## Cause and Context

### Pregnancy-Related Causes of Death

Figure 22 shows when, during the perinatal period, different underlying causes resulted in a pregnancy-related death.##

**Figure 22: Timing of Leading Underlying Causes of Pregnancy-Related Deaths, 2018-2020**



## Cause of death stratified by Race/Ethnicity is an often requested data point, but there were no statistically significance differences between groups and so further reporting was not possible at this time. As data continues to be gathered, this will be reevaluated.



## Mental Health Conditions

Overall, mental health conditions were the **most common** underlying cause of death for pregnancy-related cases. For this analysis, mental health conditions were a composite of depressive disorder, anxiety disorder, SUD and other psychiatric conditions.

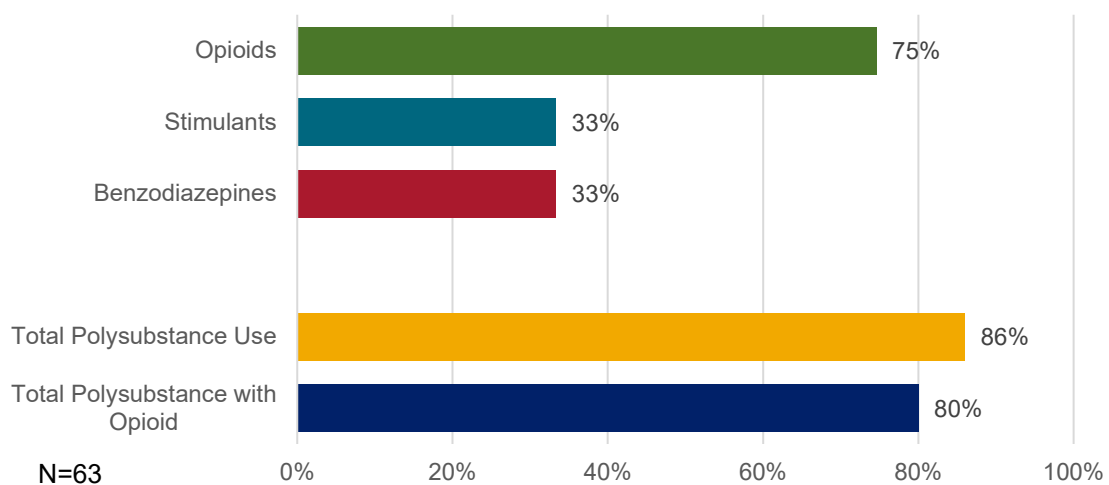
- **Mental health conditions** were the leading cause of death for mothers **between 43 days and one year postpartum**.

All healthcare providers should receive education regarding screening, referral and treatment of maternal mental health and cardiovascular disorders associated with pregnancy.

**Overdoses.** Overdoses/poisonings represented 19% of all pregnancy-related deaths. The majority (85%) of deaths due to overdoses appeared to be accidental, meaning the PAMR Board did not have evidence of them being either homicides or suicides. The majority of these cases had a history of prior substance use (69%). There is also a co-occurrence of IPV in 54% of these cases.

- The **majority** (77%) **occurred between 43 days and one year postpartum**, while 23% occurred within 6 weeks postpartum.
- The **majority** were to women aged **20-29 years old** (77%).
- The **majority** were to women who lived in **metropolitan counties** (77%).
- The **majority** were to women with a **Medicaid-covered pregnancy** (62%).

**Figure 23: Substances found in Pregnancy-Associated Overdose/Poisoning Deaths, 2018-2020**



The records obtained provided information regarding the types of substances used for pregnancy-associated deaths. **The most common drug class identified in toxicology screens was opioids (75%).** This comprised a variety of drugs including fentanyl, morphine, oxycodone and others. **This was followed by stimulants (33%),** specifically amphetamines and methamphetamines and then **benzodiazepines (33%).** Antihistamines appeared in 30% of cases; however, these are not controlled substances and were not included in Figure 23 (above). **The majority of poisoning/overdose deaths (86%) involved polysubstance use.** Opioids were detected in 80% of poisoning/overdose deaths involving multiple substances.

**Suicides.** Suicides represented 18% of pregnancy-related cases. Cases the PAMR Board determined were “probably” suicide were classified as suicide for this report. Those the board were “unable to determine” were treated as not suicides.

- The means of fatal injury for **50%** was a **firearm.**
- The **overwhelming majority** were to **white** women (92%).
- The **majority** were to women who lived in **metropolitan counties** (75%) and to those aged **20-29 years old** (58%).
- The **majority** (67%) **occurred between 43 days to one year postpartum.**

**All providers should perform a risk assessment for firearms in the home and provide education on safe firearm storage.**

### **Cardiovascular Disease**

**Providers** should utilize the **CMQCC Cardiovascular Disease (CVD) toolkit** for every obstetric patient based on risk factors and presenting symptoms.

Cardiovascular disease was the **second leading** cause of pregnancy-related death and is a composite of hypertensive disorders, cardiomyopathy and other cardiovascular conditions such as myocardial infarction or arrhythmias.

- While this was the leading cause of death **during pregnancy**, the data indicates the **greatest proportion** of these deaths **occur after the traditional six-week postpartum follow-up period.**

## Fatal Injury

All pregnancy-related injury deaths were the result of homicide and is the **third leading** cause of death, representing 12% of all pregnancy-related deaths.

- The most common means was the use of a **firearm** (75%).
- The **majority** (75%) were to **Black women** (Fig. 24).
- **All** occurred in **metropolitan areas**.
- The **majority** (75%) **occurred between 43 days and one year postpartum**.
- In **each** case, the perpetrator was a **current or former partner**.
- In **half** of these cases, the records obtained indicated a **history of DV or IPV**.

## Means of Fatal Injury

For pregnancy-related deaths, the most common means of fatal injury was overdose/poisoning, as discussed above, closely followed by firearms.

- **Firearms** were the **leading** means of fatal injury for pregnancy-related homicides and suicides.
- **Firearms** were the means of fatal injury for **18%** of all pregnancy-related deaths.
- The majority of **firearm deaths** occurred in **metropolitan areas** (83%).
- The **majority** firearm deaths were to women aged **20-29 years old** (58%).
- The **majority** of firearm **homicide** deaths were **Black** women (83%).
- The **majority** of firearm **suicide** deaths were **white** women (83%)

**Figure 24: Pregnancy-Related Fatal Injury by Race, 2018-2020**

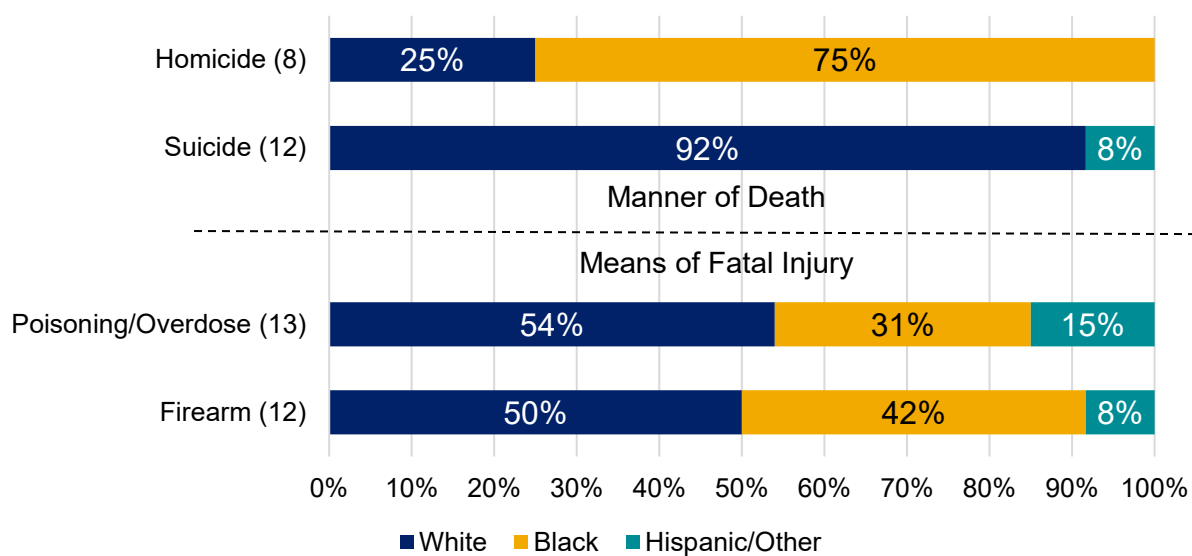
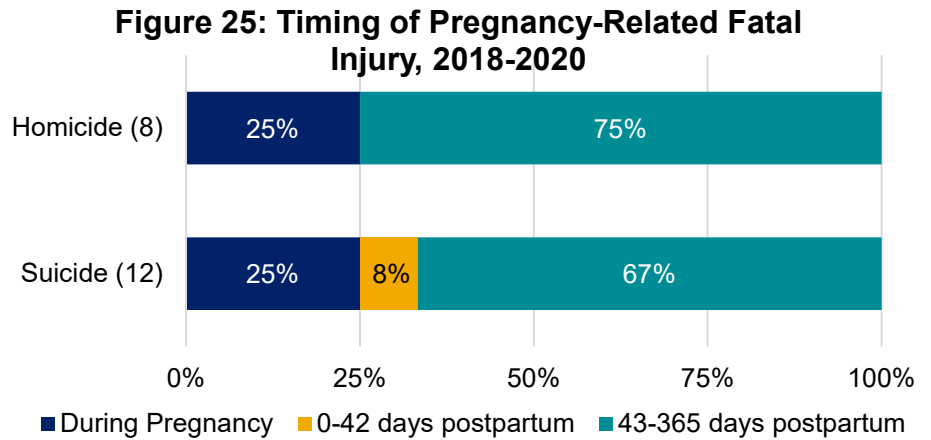


Figure 25 represents when a given type of pregnancy-related fatal injury occurred in relation to a pregnancy. Of note, the majority of pregnancy-related injury deaths occurred after 6 weeks postpartum. This includes the majority of suicides, with an underlying cause of mental health conditions and all firearm deaths (92%) occurred between 43 days and one year postpartum.



### Secondary Underlying Cause of Death

There are instances where the PAMR Board identifies a secondary underlying cause of death for pregnancy-related deaths. There were 22 of the 68 pregnancy-related cases with a secondary underlying cause of death. Mental health conditions were the most common secondary cause of death (27%), closely followed by cardiovascular disease (23%) and infection (22%).

### Circumstances Surrounding Death

The PAMR Board evaluates four additional circumstances contributing to a pregnancy-related death. These are mental health conditions other than SUD, SUD, obesity and discrimination.

#### Mental Health Conditions other than SUD

Although SUD is a mental health condition, it is important to capture data on mental health conditions that do not include SUD, such as postpartum depression. It is also worth noting that some form of perinatal mood and anxiety disorder is not uncommon. While instances of postpartum psychosis are extremely rare, postpartum depression affects 1 in 7 mothers.<sup>13</sup>

- For women who experienced a pregnancy-related death where mental health conditions other than SUD were a contributing factor:
  - **52%** had been treated for **depression** prior to their most recent pregnancy.
    - During pregnancy, this number **decreased** to 40%.
    - After pregnancy, this number increased slightly back up to 44%.
  - **32%** had been treated for an **anxiety disorder** prior to this pregnancy.
    - During pregnancy, this number remained at 32%.

- After pregnancy, this number **decreased** to 28%.
- In 52% of pregnancy-related deaths where a mental health condition other than SUD was determined to be a contributing factor, the records also indicated the decedent had a history of substance use.

Overall, mental health conditions other than SUD contributed to more than 1 in 3 (37%) pregnancy-related deaths during the aggregate period. This is slightly higher than the rate of one in five pregnant women who may be affected by depression, anxiety and other mental health conditions.<sup>14</sup> Over 14,000 Missouri families are annually impacted by maternal mental health conditions, with an estimated cost of \$467 million if left untreated.<sup>15,16</sup>



## **Substance Use Disorder**

### ***State of Missouri***

From 2018-2020 there were 3,599 opioid overdose deaths overall in Missouri. Women of childbearing age (10-60 years old) represented 29% of these deaths (1,040).<sup>17</sup> Given the increase in overdose-related deaths in Missouri, this remains an area of public health concern.<sup>18</sup>

- White women represented 77% of these deaths.
- Black women represented 22% of these deaths.
- An average of 75% per year had non-alcohol substance use.<sup>§§</sup>
- An average of 12% per year had a prior overdose.

### ***PAMR Deaths***

SUDs include opiates, alcohol and other substances. Although documentation of an existing diagnosed SUD was not always present in medical records, there was sufficient evidence for the PAMR Board to confidently say a SUD was present.

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<sup>§§</sup> The last two points should be treated as a minimum as the witnesses that State Unintentional Drug Overdose Reporting System (SUDORS) data relies upon may be unable to provide a complete history for the victim. Additionally, this represents roughly 75% of state overdose deaths, primarily from urban counties.

- **Two-thirds** of the pregnancy-related cases where SUD was a contributing factor also listed **mental health conditions other than SUD** as a contributing factor.
- **One-third** of these deaths had a history of **DV or IPV**.
- Of those pregnancy-related deaths where SUD was a contributing factor, there were frequent social and emotional stressors that appeared, as well as potential touchpoints for intervention:
  - **38%** had a history of substance use **treatment**.
  - **50%** experienced **unemployment**.
  - **54%** had involvement with **CPS**.

SUD contributed to **35%** of pregnancy-related deaths.

## Obesity

Obesity played a direct role in **15%** of pregnancy-related deaths.

The board similarly evaluates obesity, defined as a pre-pregnancy BMI of 30 or above. Obesity continues to be a public health concern across the country and is a high risk factor for both maternal mortality and SMM.<sup>19</sup> The finding that obesity was not a contributing factor does not mean the decedent was not obese.

- While **30%** of total live births were to **obese** women, they represented **47% of pregnancy-related deaths**.

## Discrimination

The board considered discrimination due to age, race, class, social economics, stigmatizing language and other variables. Though three-year aggregate data is not yet available, discrimination was a contributing factor to 6% of pregnancy-related cases in 2020.

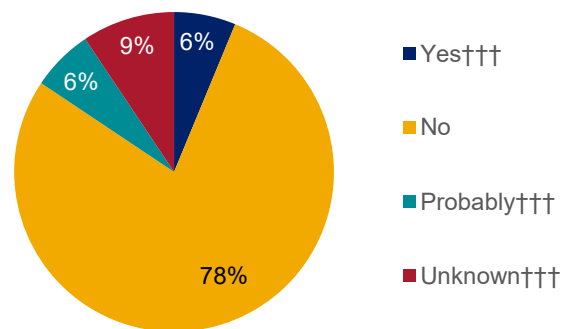
### Examples:

1. *Patient noted as having “meth mouth” in medical records resulting in numerous urine drug screens all of which were negative. There was no history of substance use or other indication to justify these actions.*

2. *Physician notes indicated assumptions about the patient's adherence to treatment. "[The patient] likely isn't taking medication as prescribed." There was no documentation of discussion regarding barriers to accessing medication. Rather, it was just an assumed non-compliance issue.*
3. *There were instances where patients with careers in the medical field had lack of treatment that was below the standard of care. Despite one's educational background, all patients should be screened, referred and educated according to standards of care.*

Another 6% of cases probably experienced discrimination. Ongoing work in this area continues as the board seeks to address where discrimination played a role in maternal mortality. Additional analysis is currently unavailable due to small population size and presented information should be used with extreme caution, as the population is too small to calculate stable ratios at this time (Fig. 26).

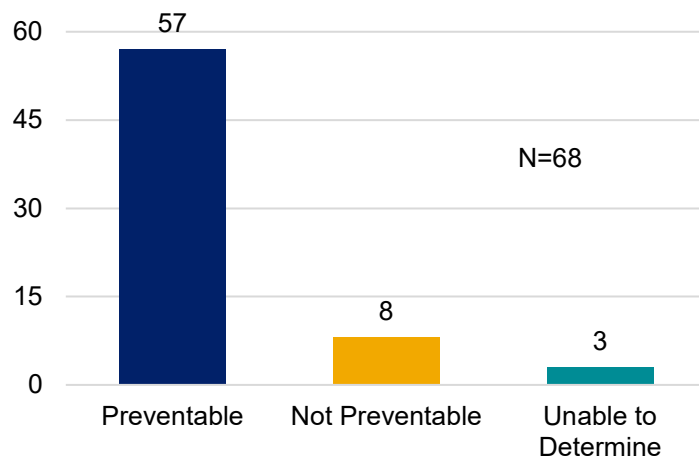
**Figure 26: Pregnancy-Related Deaths and Discrimination, 2020**



## Preventability and Recommendations

\*\*\* Ratios are unstable due to small sample size and extreme caution should be taken when using this data.

**Figure 27: Preventability of Pregnancy-Related Deaths, 2018-2020**



### Preventability

The PAMR Board evaluated if a pregnancy-related death was preventable and then made recommendations to prevent future events. **The board determined that 84% of pregnancy-related deaths were preventable (Fig. 27).**

Preventability encompasses a variety of situations that could have altered the outcome, including missed opportunities for screening during prior healthcare

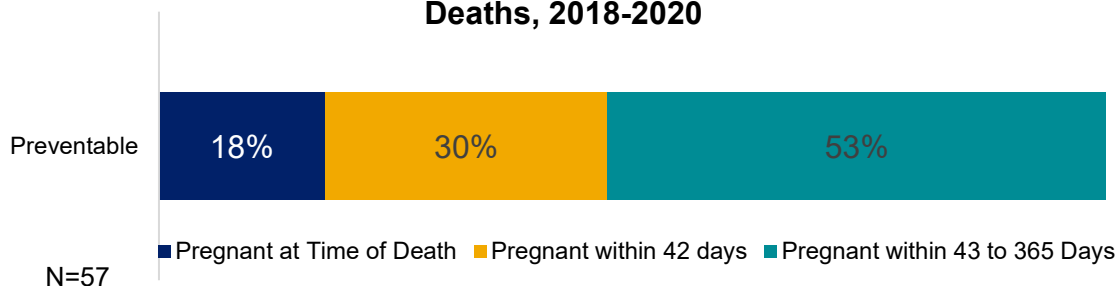
encounters, intervention by family or friends, and individual knowledge of warning signs. Preventable pregnancy-related deaths varied by cause of death.

- **All** pregnancy-related deaths due to **mental health conditions** were determined to be **preventable**.
  - **68%** of which occurred between **43 days and one year postpartum**.
- **Two-thirds** of deaths due to **hemorrhage** were determined to be **preventable**.
  - **75%** of which occurred **within 42 days postpartum** while the other 25% occurred during pregnancy.
- **72%** of deaths due to **cardiovascular disease** were determined to be **preventable**.
  - **54%** occurred between **43 days and one year postpartum**.

Looking at the timing of preventable pregnancy-related deaths (Fig. 28), more than half of them (53%) occurred between 43 days and one year postpartum. Although the majority of preventable pregnancy-related deaths occurred postpartum, it is important that early identification and timely treatment is initiated to prevent progression of disease. Deaths with no chance of preventability were most commonly due to cardiovascular disease despite timely interventions and following standards of care.



**Figure 28: Timing of Preventable Pregnancy-Related Deaths, 2018-2020**



Looking at where these deaths occur, more than half (51%) of pregnancy-related deaths occurred within a hospital. Twenty-six (74%) were inpatient and nine were outpatient/ER. Sixty-nine percent of inpatient deaths and 100% of outpatient/ER deaths were considered preventable. A further 20 pregnancy-related deaths occurred at the decedents home, 90% of which were determined to be preventable. It should be noted that this only indicates where a death occurred, which is not necessarily where the underlying event occurred.

## Recommendations

This section provides recommendations based upon the leading causes of pregnancy-related deaths, contributing factors and recommendations for action. To develop recommendations, the board utilizes the committee decisions form (Appendix B). Contributing factors can occur in one of five levels: patient/family, provider, facility, community and system. The board seeks to identify a range of recommendations to address multiple levels, types of prevention and expected impact. To better understand the discussion going forward, it is important to know that contributing factors, which occur at one level, may have solutions that can be implemented at another level.

**Mental Health Conditions.** The leading contributing factor for pregnancy-related deaths due to mental health conditions was *assessment* followed by *knowledge*.



All providers should utilize validated screening tools to perform a full assessment for depression, anxiety and SUD and make warm referrals to mental health professionals, community health workers and SUD treatment programs.

The board placed particular emphasis on early intervention and coordinating care with social workers and community health workers through warm referrals, or a transfer of care between members of the healthcare team. Ideally, this would occur within the same clinic setting. However, noting limitations of that strategy, another option is to

ensure women have a scheduled appointment with the referral agency prior to leaving the appointment.



The Missouri legislature should establish and fund a statewide Perinatal Psychiatry Access Program (similar to the Child Psychiatry Access Program) in order to provide much-needed services in an area of extreme shortage.

Another leading contributing factor identified was *knowledge* when the board found that either the provider, patient or family had an inadequate understanding of the significance of mental health conditions, especially during the perinatal period or the need for treatment/follow-up. There were numerous instances where providers or patients discontinued medications for their mental health condition due to the pregnancy and assumed risks to the fetus.



All providers should be further educated on the treatment of mental health conditions, including SUD during and after pregnancy.

The PAMR Board included all providers in this recommendation because providers other than obstetricians, like pediatricians and emergency physicians, encounter pregnant and postpartum women. Provider knowledge is imperative in order to have the tools to treat and ensure patients are informed decision-makers in their care.



Community-based organizations should expand resources and education to their community on maternal mental health and SUD to reduce stigma.

**Cardiovascular Disease.** The leading contributing factors for cardiovascular disease was *assessment*, followed by *continuity of care/care coordination*, and *access/financial and knowledge*.



Hospitals should standardize practices and procedures across the healthcare system by using evidence-based practices, such as the Hypertension in Pregnancy AIM bundle.



Obstetric providers should refer patients with a cardiovascular condition or a family history of cardiovascular disease to a cardiologist.

Continuity of care and care coordination between the obstetric provider and cardiologist is imperative to ensure baseline testing (i.e. complete blood count (CBC), electrocardiogram and echocardiogram). Close pregnancy monitoring and testing are done to prevent delays in time-critical care. For newly identified cardiovascular conditions, it is essential that providers counsel patients on risks in subsequent pregnancies (i.e. preconception care) and long-term health risks.

As discussed previously, half of pregnancy-related deaths due to cardiovascular diseases occurred beyond the traditional six-week postpartum follow-up period and often after the 60-day Medicaid coverage ended.



The Missouri legislature should extend and fund Medicaid to one year postpartum for all conditions to aid women whose condition is exacerbated in the postpartum period.



Insurance companies should expand covered services and equipment to manage and monitor cardiovascular conditions (i.e. home health, home blood pressure monitors).

During 2020, at-home blood pressure monitoring was essential for early identification and treatment of hypertensive disorders in pregnancy (HDP). The Missouri Hospital Association utilized grant funding to distribute Cuff Kits™ to high-risk pregnant and postpartum moms through various partners. A kit includes an automatic blood pressure monitor, a blood pressure monitoring log and educational materials.



All providers should be further educated regarding screening, referral and treatment of cardiovascular disorders associated with pregnancy (i.e. cardiomyopathy, hypertension, etc.).

The recommendation is for all providers, including emergency room physicians and urgent care facilities where women may seek care. High blood pressure parameters during and after pregnancy are lower than those for non-pregnant adults. Many times instances of high blood pressure were untreated. It is imperative that providers ask women of childbearing age if they have been pregnant within the last year to determine treatment paths and assess their cardiovascular risks. Additionally, some postpartum women presented with swelling that providers attributed to “normal pregnancy/postpartum” symptoms and/or shortness of breath that was attributed to anxiety, smoking, obesity and/or asthma, and not correlated with cardiomyopathy.

**Injury.** The most common contributing factor for pregnancy-related deaths due to injury was *violence*.



State agencies, in partnership with community partners, should implement community violence intervention (CVI) programs with a focus on reducing homicides to pregnant and postpartum women.



Community-based organizations should collaborate with health care facilities and providers to educate their community on domestic violence (DV) and intimate partner violence (IPV), and provide resources and assistance for women affected by DV or IPV.



Healthcare providers should screen all women for DV and IPV and perform a risk assessment of firearms in the home if indicated.

Improving safety for pregnant and postpartum women will require a multi-level and multi-disciplinary approach. **Medical providers can intervene early using innovative strategies, such as offering a way to indicate IPV on a urine sample cup for safely communicating beyond standard screenings.** Communities can also create awareness of the problem. However, it is important to understand the difference between awareness and prevention. Awareness activities, such as one-time events or education sessions, will not change the beliefs, attitudes or behaviors required to prevent violence. Yet, without a basic understanding of the nature and dynamics of IPV, a community may not have the context to do true prevention work alone.

Institutional and community awareness of the issue is needed, as it is the first step to understanding the concept of prevention. Thus, awareness is necessary but not sufficient to achieve societal change. Awareness must mobilize the community to take action and engage in prevention efforts in order to bring about societal change. Comprehensive primary prevention programming can foster that change.<sup>†††</sup>

**Hemorrhage.** The most common contributing factors for pregnancy-related deaths due to hemorrhage were *assessment* followed by *policies/procedures*.



All healthcare facilities should implement the AIM Hemorrhage bundle.

The PAMR Board emphasized early initiation of a mass transfusion protocol, along with obstetric simulations to prepare for obstetrical emergencies.

### Other Recommendations.



All healthcare workers should complete trainings on trauma-informed care and implicit bias to support patient engagement and improve health outcomes.

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<sup>†††</sup> For more information and evidence on how communities, families and individuals can make their communities safer, visit <https://www.cdc.gov/violenceprevention/intimatepartnerviolence/>.

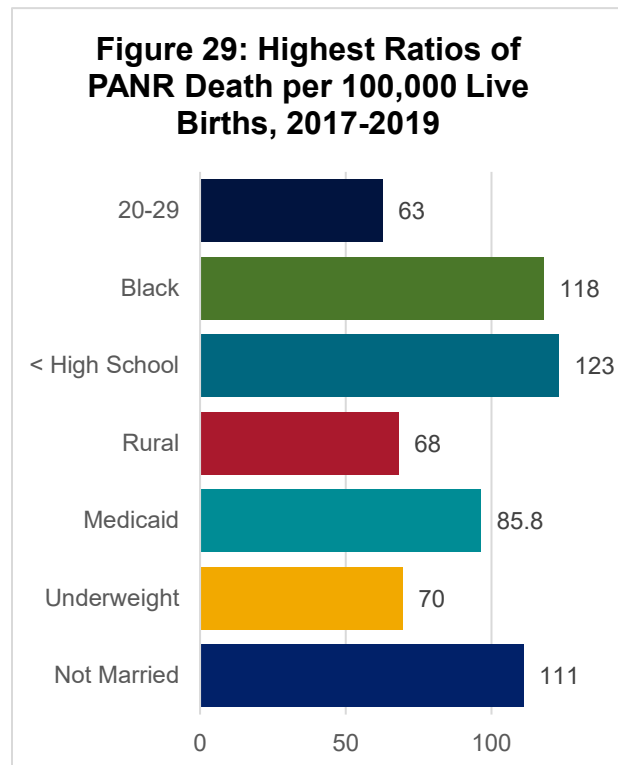
## Insights from Pregnancy-Associated, Not Related Deaths

While pregnancy-related death prevention is the primary focus of the PAMR program, there are also excellent insights to be gained from PANR deaths. These cases are not assessed for preventability, but the PAMR Board does evaluate these deaths for manner of death, means of fatal injury and contributing factors to make recommendations that may prevent similar deaths in the future. **The leading cause for PANR deaths was poisoning/overdoses (36%), followed by motor vehicle collisions (MVC) at 29%.**

### PANR Disparities

As with pregnancy-related deaths, there are demographic differences in the ratios of PANR deaths. Figure 29 provides a demographic breakdown of those groups with the highest ratio of PANR deaths.

- Those aged 20-29 had the highest ratio of any age group.
- Black women had a ratio 2.7 times that of white women.

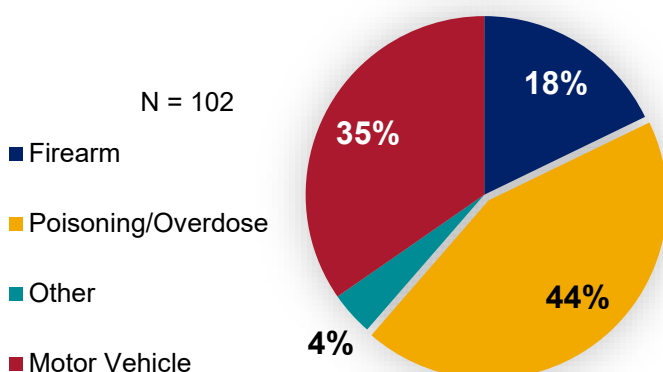


- Those with less than a high school diploma or GED had a ratio that was more than 6 times the ratio for those with more than a high school diploma or GED.
- The ratio for those with a Medicaid-covered pregnancy was more than 10 times the ratio of those with private insurance.
- Those who were underweight had the highest ratio with a ratio roughly 1.6 times the ratio for those with a healthy BMI. It should be noted that the highest percentage, not ratio, of PANR deaths were to women who were overweight/obese (53%).
- The ratio for those who were not married was more than 6 times the ratio of those who were married.

The majority of PANR injury-related deaths (71%), such as homicides, suicides, MVCs and overdoses, occurred between 43 days and one year postpartum. However, 16% of PANR deaths due to overdoses/poisonings occurred during pregnancy. Figure 30 further breaks down the means of injury for PANR deaths.

**Rural** women had the **highest** ratio of PANR deaths.

**Figure 30: PANR Means of Injury, 2018-2020**



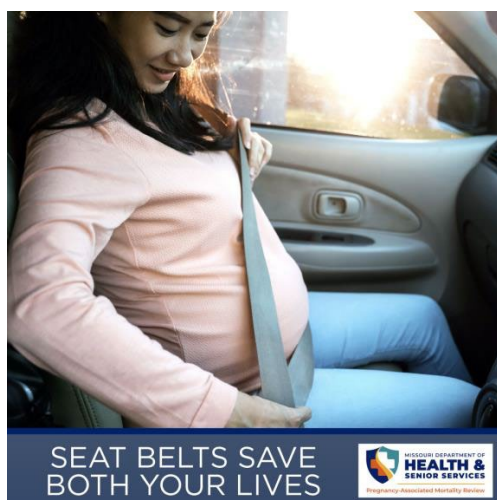
As

overdoses were the most common means of accidental death, further analysis was warranted.

- 64% were white women.
- 62% were between 20 and 29 years old.
- 82% were residents of metropolitan counties.
- More than 4 of 5 (84%) had a history of substance use, but only

29% had a history of substance use treatment.

- An additional 18% had a history of psychiatric hospitalization or treatment.
- 11% had a prior suicide attempt.



MVCs were the second most frequent cause of accidental PANR death. Additional analysis indicated:

- 73% were not buckled up (excluding pedestrians hit by vehicles).
- 26% occurred during pregnancy.
- 60% had a Medicaid-covered pregnancy.
- 63% were to women 20-29 years old.
- 68% resided in metropolitan counties.
- 2019 had the lowest number of fatalities due to MVCs overall (7).

For PANR homicide deaths:

- 95% were committed with firearms.

- The relationship of the perpetrator to the decedent was unknown for the majority (53%) of cases.
- 26% had a history of DV (26%).<sup>††</sup>
- 63% were between 20 and 29 years old.
- 74% were Black women.
- 84% occurred in metropolitan areas.
- 53% experienced unemployment.
- 47% had a history of substance use (47%).

## **Recommendations**

In addition to the above recommendations regarding pregnancy-related deaths, the PAMR Board recommended the following:

### ***Mental Health, including Substance Use Disorder***

- All providers should perform validated depression, anxiety and SUD screenings at multiple intervals throughout pregnancy and the postpartum period, making referrals to mental health providers as appropriate.
- All providers should ensure pregnant and postpartum patients at increased risk for opioid overdose carry naloxone.
- Providers should educate themselves annually through professional journals, webinars, conferences, etc. regarding screening, referral and treatment of:
  - A. Mental health conditions.
  - B. Substance use disorder.
  - C. Cardiovascular disorders associated with pregnancy (i.e. cardiomyopathy, hypertension, etc.).
  - D. Trauma-informed care.
- Healthcare facilities should use social work and community health workers to increase continuity of care for referrals, follow-up care, communication and social determinants of health.
- Community organizations should provide outreach to educate women on preconception health, as well as early and consistent prenatal care to optimize a woman's health.
- Local housing authorities should implement system-wide policies that prioritize housing for pregnant and postpartum people.

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<sup>††</sup> Information regarding homicides is, at times, limited by ongoing investigations. Additionally, the data may be skewed somewhat as those cases where the perpetrator is a significant other tend to be treated as pregnancy-related rather than PANR.

## ***Motor Vehicle Crashes***

- State agencies, healthcare providers, CBOs and families should increase public awareness of the importance of seat belt safety during the perinatal period.
- The Missouri legislature should increase the seat belt violation fine from \$10 to \$60 by 2024.
- The Missouri legislature should pass a state primary enforcement seat belt law that covers all occupants, regardless of where they are sitting in the vehicle by 2024.

## ***Homicides***

- State agencies, in partnership with community partners, should implement community violence intervention (CVI) programs with a focus on reducing homicides of pregnant and postpartum women.
- Government agencies, in partnership with financial institutions and philanthropic funders, should invest in urban infrastructure (grocery stores, medical care access, banks and playgrounds) to increase maternal health outcomes and decrease violence.
- Community-based organizations should collaborate with health care facilities and providers to educate their community on domestic violence (DV) and intimate partner violence (IPV), and provide resources and assistance for women affected by DV or IPV.

## ***Other Recommendations***

During case reviews, the PAMR Board discussed recommendations and opportunities for strengthening systems and processes, even though these actions may not have prevented the specific death. These included:

- Maintaining standards of care regardless of surrounding circumstances.<sup>§§§</sup>
- All medical death certifiers should ensure an autopsy and toxicology are completed on a woman who has been pregnant within the last year.

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<sup>§§§</sup> **COVID-19:** Although there were no pregnancy-associated deaths from COVID-19 during this reporting period, there were lessons learned during the case reviews. The PAMR Board acknowledged that at that time everyone was learning to navigate in a time of uncertainty and fear, while conforming to stay at home orders. A major lesson learned is that no matter what may be occurring, standards of care should be maintained and adhered to. This was directly related to delays in testing and procedures and/or a lack of in-person prenatal and postpartum visits, particularly for those at risk (i.e. follow-up blood pressure monitoring and maternal mental health conditions).



- Birthing hospitals should ensure that women are scheduled for a postpartum visit or other follow-up appointments prior to discharge and providers should establish processes to perform follow-up phone calls if a client does not present to a follow-up visit (i.e. postpartum visit).

## **Implementation and Improvement**

The PAMR program has continued to work toward the improvement of data gathering and dissemination. To that end, the program has worked to expand the identification techniques used to enhance case identification. Additionally, the program has greatly increased its dissemination capabilities through fostering partnerships and expanding tools available for this task, such as the development of an interactive data dashboard. The program has also worked with partners to improve timeliness and to enhance the information available to the board through the abstraction process, particularly with regard to SDOH.

### **Summary of Major Accomplishments**

The following accomplishments occurred in 2022 and the first half of 2023:

- Expanded PAMR case identification techniques to be more comprehensive and improve timeliness of case identification.
- Developed and published an online [public data dashboard](#) reporting on pregnancy-associated deaths.
- Completed 44 dissemination activities on maternal mortality, including dissemination of an infographic through social media on Jan. 23 to mark Maternal Health Awareness Day (Appendix C).
- Presented a poster of PAMR data at PQC convention and presented at the annual Association of Maternal and Child Health Programs conference titled “Polysubstance Abuse: A Pervasive Threat to Maternal Health in Missouri” (Appendix D).
- Continued contracting with the Missouri Hospital Association on maternal mortality prevention efforts, including caring for the mother-baby dyad affected by substance use, severe hypertension in pregnancy and obstetric hemorrhage.
- Shared aggregate PAMR data as part of CDC’s Pregnancy-Related Deaths: Data from Maternal Mortality Review Committees in 36 US States, 2017-2019 brief.
- Incorporated Community Vital Signs (CVS) indicator dashboard in PAMR case narratives and meetings. The CVS is a tool providing community and social-level contextual information in maternal mortality cases.
- Participated in Emory University’s CVS Technical Assistance to increase actionable PAMR recommendations at the community-level.
- Published Missouri maternal and neonatal levels of care (LOC).
- Developed and implemented five new maternal health programs.
  - Maternal autopsies: To increase the number of maternal mortalities having an autopsy completed to accurately understand underlying causes of death.

- BABY & ME – Tobacco Free Program™ Statewide Telehealth: An evidence-based, smoking cessation program proven to reduce the burden of tobacco on the pregnant and postpartum population.
- Prenatal Care Clinic: Offering free comprehensive prenatal care to pregnant people in Kansas City.
- Cora Faith Walker Doula Training: Providing doula training to those who primarily serve minority populations to improve health outcomes, breastfeeding knowledge and prenatal and postpartum care for mother and baby.
- PQC: Quality care collaborative focused on improving the care and outcomes of the mother/baby dyad through implementation of the Care for Pregnant and Postpartum People with Substance Use Disorder AIM safety bundle and Eat, Sleep, Console model of care.
- Governor Parson prioritized maternal health by allocating \$4.3 million to DHSS to implement its maternal mortality plan, which will address:
  - Reduction in maternal mortality disparities.
  - Systems-level improvements to address leading causes of preventable deaths.
  - Increased access to maternal health services, including behavioral health services
  - Enhanced data quality and access to drive decisions
- Completed a statewide maternal mortality awareness campaign through radio and social media messaging (Appendix E).
- Continued COVID-19 response throughout pandemic surges.



## **Conclusion**

Maternal mortality in the state of Missouri is exceptionally complex. It touches the societal issues of health disparities, lack of access to care and the ongoing opioid epidemic. Seeking to understand this problem brings to light a variety of other concerns rooted in the systems that are intended to help. Through addressing the issues the PAMR Board identified, the State of Missouri seeks to decrease maternal mortality, while simultaneously improving the health of women, particularly during the reproductive years and after.

It is with this goal in mind, that the PAMR Board developed key recommendations, which can reverse the trajectory of maternal mortality in Missouri if they are implemented. Moving forward, the PAMR Board will continue to review cases of maternal mortality and provide recommendations to eliminate preventable maternal mortality in the future.

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## **Appendix A: Methodology**

### **Distinguishing PAMR**

The CDC oversees multiple programs that monitor maternal mortality. These programs offer valuable information at the national level regarding causes of death and associated risk factors. However, they are not able to evaluate contextual factors that contributed to individual deaths beyond data on the death certificate or to determine preventability. They also use a more narrow definition of what deaths are related to pregnancy.

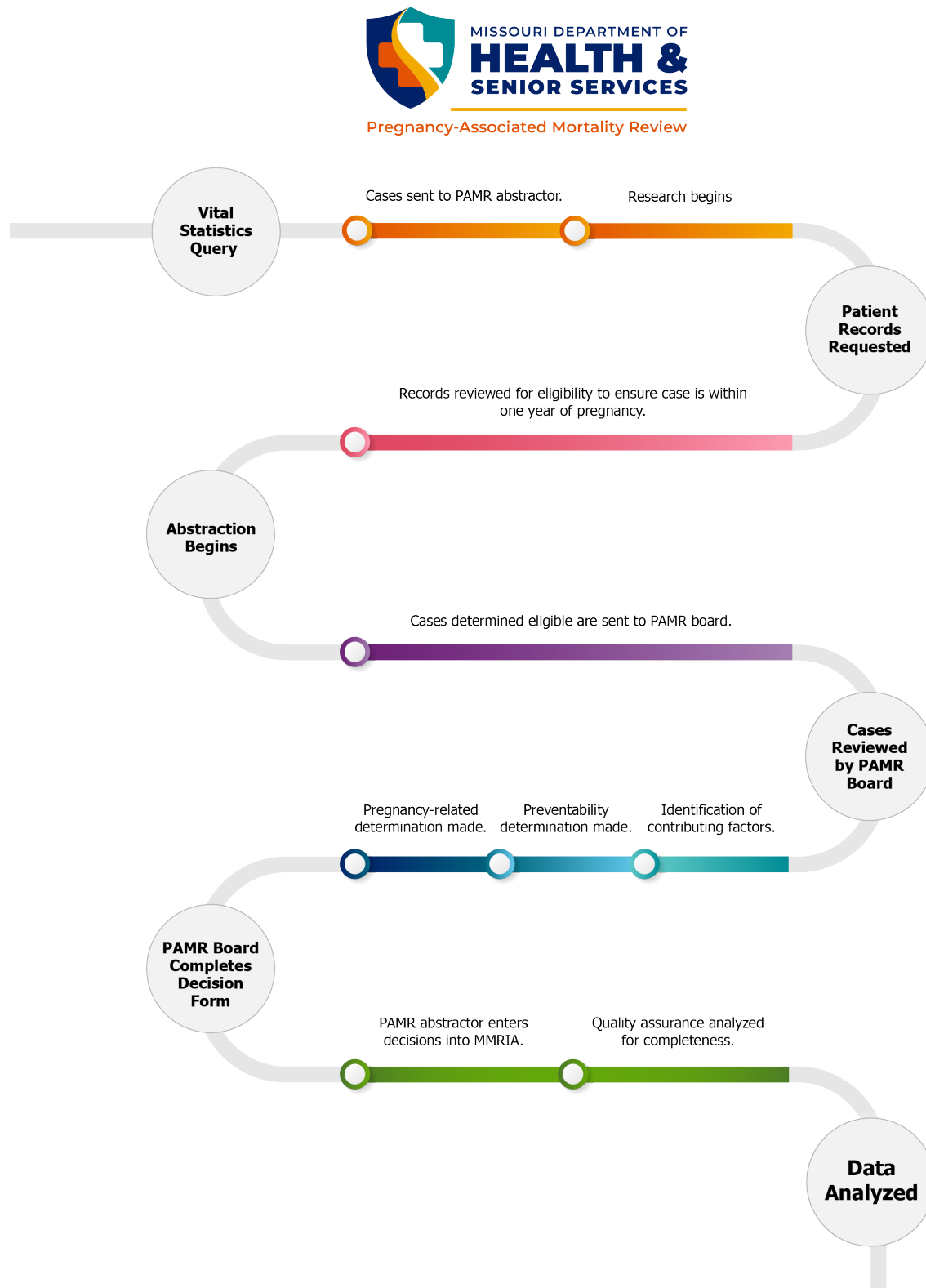
The PAMR program differs from these national programs in that it functions as the state's Maternal Mortality Review Committee (MMRC). MMRCs operate using a standardized and comprehensive system to better understand the context and causes surrounding a woman's death. They assess if a death could have been prevented and make recommendations to help similar situations have better outcomes. While focused on the prevention of death, MMRCs also act to improve health and wellness throughout the reproductive life cycle.

### **PAMR Process**

The Office of Epidemiology (OOE) identifies cases of maternal mortality for the PAMR program to investigate using vital records and hospital data through the Patient Abstract System (PAS). After OOE identifies cases, they pull the information for those cases from the Bureau of Vital Records including the death certificate, birth certificate and fetal death information. The program supplements this data with data from the PAS, noting where and when identified cases interacted with the healthcare system to allow the program to request medical records.

Once cases have been identified and the data exported, they are forwarded to the PAMR abstractor for further investigation. This includes obtaining medical records, toxicology reports, news articles, social media postings and other data. The abstractor is able to further determine if a case was a false positive, through the information they obtain, for instance, when a woman's medical records indicate they have had a hysterectomy. The information for deaths that were not deemed false positives is then used to create a summary of the events that led up to and ended in death. The summary is then given to the multi-disciplinary PAMR Board who evaluate the case to determine pregnancy relatedness, as well as the contributing factors and preventability of a death. The PAMR Board also makes recommendations in order to help improve the outcome of similar situations in the future. See Figure 31 for a visual overview of the PAMR process.

**Figure 31: Flow Chart of PAMR Program Process**



## Appendix B: Committee Decisions Form

<span style="float: right;">MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v21 <span style="margin-left: 20px;">1</span></span>												
<b>REVIEW DATE</b> <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div> <small>Month/Day/Year</small>	<b>RECORD ID #</b> <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div>	<div style="text-align: center; background-color: #2c3e50; color: white; padding: 5px; font-weight: bold;">COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH</div> <div style="background-color: #2c3e50; color: white; padding: 5px; font-weight: bold; margin-top: 5px;">IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING* CAUSE OF DEATH</div> <div style="margin-top: 5px;">Refer to page 3 for PMSS-MM cause of death list.</div>										
<b>PREGNANCY-RELATEDNESS: SELECT ONE</b>  <input type="checkbox"/> <b>PREGNANCY-RELATED</b> A death during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy  <input type="checkbox"/> <b>PREGNANCY-ASSOCIATED, BUT NOT-RELATED</b> A death during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy  <input type="checkbox"/> <b>PREGNANCY-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS</b>		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #2c3e50; color: white;"> <th style="width: 20%;">TYPE</th> <th style="width: 80%;">OPTIONAL: CAUSE (DESCRIPTIVE)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">UNDERLYING*</td><td></td></tr> <tr><td style="text-align: center;">CONTRIBUTING</td><td></td></tr> <tr><td style="text-align: center;">IMMEDIATE</td><td></td></tr> <tr><td style="text-align: center;">OTHER SIGNIFICANT</td><td></td></tr> </tbody> </table>	TYPE	OPTIONAL: CAUSE (DESCRIPTIVE)	UNDERLYING*		CONTRIBUTING		IMMEDIATE		OTHER SIGNIFICANT	
TYPE	OPTIONAL: CAUSE (DESCRIPTIVE)											
UNDERLYING*												
CONTRIBUTING												
IMMEDIATE												
OTHER SIGNIFICANT												
<b>ESTIMATE THE DEGREE OF RELEVANT INFORMATION (RECORDS) AVAILABLE FOR THIS CASE:</b>  <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> <b>COMPLETE</b>            All records necessary for adequate review of the case were available   <input type="checkbox"/> <b>MOSTLY COMPLETE</b>            Minor gaps (i.e., information that would have been beneficial but was not essential to the review of the case)         </div> <div style="width: 45%;"> <input type="checkbox"/> <b>SOMEWHAT COMPLETE</b>            Major gaps (i.e., information that would have been crucial to the review of the case)   <input type="checkbox"/> <b>NOT COMPLETE</b>            Minimal records available for review (i.e., death certificate and no additional records)   <input type="checkbox"/> <b>N/A</b> </div> </div>		<div style="background-color: #2c3e50; color: white; padding: 5px; font-weight: bold; text-align: center;">COMMITTEE DETERMINATIONS ON CIRCUMSTANCES SURROUNDING DEATH</div> <div style="margin-top: 5px;">             DID <b>OBESITY</b> CONTRIBUTE TO THE DEATH? <input type="checkbox"/> YES <input type="checkbox"/> PROBABLY <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN           </div> <div style="margin-top: 5px;">             DID <b>DISCRIMINATION**</b> CONTRIBUTE TO THE DEATH? <input type="checkbox"/> YES <input type="checkbox"/> PROBABLY <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN           </div> <div style="margin-top: 5px;">             DID <b>MENTAL HEALTH CONDITIONS OTHER THAN SUBSTANCE USE DISORDER</b> CONTRIBUTE TO THE DEATH? <input type="checkbox"/> YES <input type="checkbox"/> PROBABLY <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN           </div> <div style="margin-top: 5px;">             DID <b>SUBSTANCE USE DISORDER</b> CONTRIBUTE TO THE DEATH? <input type="checkbox"/> YES <input type="checkbox"/> PROBABLY <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN           </div> <div style="background-color: #2c3e50; color: white; padding: 5px; font-weight: bold; text-align: center; margin-top: 10px;">MANNER OF DEATH</div> <div style="margin-top: 5px;">             WAS THIS DEATH A SUICIDE? <input type="checkbox"/> YES <input type="checkbox"/> PROBABLY <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN           </div> <div style="margin-top: 5px;">             WAS THIS DEATH A HOMICIDE? <input type="checkbox"/> YES <input type="checkbox"/> PROBABLY <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN           </div> <div style="margin-top: 10px;"> <table style="width: 100%;"> <tr> <td style="width: 25%; vertical-align: top;">               IF ACCIDENTAL DEATH, HOMICIDE, OR SUICIDE, LIST THE MEANS OF FATAL INJURY             </td> <td style="width: 25%; vertical-align: top;"> <input type="checkbox"/> FIREARM  <input type="checkbox"/> SHARP INSTRUMENT  <input type="checkbox"/> BLUNT INSTRUMENT  <input type="checkbox"/> POISONING/ OVERDOSE  <input type="checkbox"/> HANGING/ STRANGULATION/ SUFFOCATION             </td> <td style="width: 25%; vertical-align: top;"> <input type="checkbox"/> FALL  <input type="checkbox"/> PUNCHING/ KICKING/BEATING  <input type="checkbox"/> EXPLOSIVE  <input type="checkbox"/> DROWNING  <input type="checkbox"/> FIRE OR BURNS  <input type="checkbox"/> MOTOR VEHICLE             </td> <td style="width: 25%; vertical-align: top;"> <input type="checkbox"/> INTENTIONAL NEGLECT  <input type="checkbox"/> OTHER, SPECIFY:  <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div> <input type="checkbox"/> UNKNOWN  <input type="checkbox"/> NOT APPLICABLE             </td> </tr> </table> </div> <div style="margin-top: 10px;"> <table style="width: 100%;"> <tr> <td style="width: 25%; vertical-align: top;">               IF HOMICIDE, WHAT WAS THE RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT?             </td> <td style="width: 25%; vertical-align: top;"> <input type="checkbox"/> NO RELATIONSHIP  <input type="checkbox"/> PARTNER  <input type="checkbox"/> EX-PARTNER  <input type="checkbox"/> OTHER RELATIVE             </td> <td style="width: 25%; vertical-align: top;"> <input type="checkbox"/> ACQUAINTANCE  <input type="checkbox"/> OTHER, SPECIFY:  <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div> </td> <td style="width: 25%; vertical-align: top;"> <input type="checkbox"/> UNKNOWN  <input type="checkbox"/> NOT APPLICABLE             </td> </tr> </table> </div>	IF ACCIDENTAL DEATH, HOMICIDE, OR SUICIDE, LIST THE MEANS OF FATAL INJURY	<input type="checkbox"/> FIREARM <input type="checkbox"/> SHARP INSTRUMENT <input type="checkbox"/> BLUNT INSTRUMENT <input type="checkbox"/> POISONING/ OVERDOSE <input type="checkbox"/> HANGING/ STRANGULATION/ SUFFOCATION	<input type="checkbox"/> FALL <input type="checkbox"/> PUNCHING/ KICKING/BEATING <input type="checkbox"/> EXPLOSIVE <input type="checkbox"/> DROWNING <input type="checkbox"/> FIRE OR BURNS <input type="checkbox"/> MOTOR VEHICLE	<input type="checkbox"/> INTENTIONAL NEGLECT <input type="checkbox"/> OTHER, SPECIFY: <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div> <input type="checkbox"/> UNKNOWN <input type="checkbox"/> NOT APPLICABLE	IF HOMICIDE, WHAT WAS THE RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT?	<input type="checkbox"/> NO RELATIONSHIP <input type="checkbox"/> PARTNER <input type="checkbox"/> EX-PARTNER <input type="checkbox"/> OTHER RELATIVE	<input type="checkbox"/> ACQUAINTANCE <input type="checkbox"/> OTHER, SPECIFY: <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/> UNKNOWN <input type="checkbox"/> NOT APPLICABLE		
IF ACCIDENTAL DEATH, HOMICIDE, OR SUICIDE, LIST THE MEANS OF FATAL INJURY	<input type="checkbox"/> FIREARM <input type="checkbox"/> SHARP INSTRUMENT <input type="checkbox"/> BLUNT INSTRUMENT <input type="checkbox"/> POISONING/ OVERDOSE <input type="checkbox"/> HANGING/ STRANGULATION/ SUFFOCATION	<input type="checkbox"/> FALL <input type="checkbox"/> PUNCHING/ KICKING/BEATING <input type="checkbox"/> EXPLOSIVE <input type="checkbox"/> DROWNING <input type="checkbox"/> FIRE OR BURNS <input type="checkbox"/> MOTOR VEHICLE	<input type="checkbox"/> INTENTIONAL NEGLECT <input type="checkbox"/> OTHER, SPECIFY: <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div> <input type="checkbox"/> UNKNOWN <input type="checkbox"/> NOT APPLICABLE									
IF HOMICIDE, WHAT WAS THE RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT?	<input type="checkbox"/> NO RELATIONSHIP <input type="checkbox"/> PARTNER <input type="checkbox"/> EX-PARTNER <input type="checkbox"/> OTHER RELATIVE	<input type="checkbox"/> ACQUAINTANCE <input type="checkbox"/> OTHER, SPECIFY: <div style="border: 1px solid #ccc; height: 20px; width: 100%; margin-top: 5px;"></div>	<input type="checkbox"/> UNKNOWN <input type="checkbox"/> NOT APPLICABLE									
<b>DOES THE COMMITTEE AGREE WITH THE UNDERLYING* CAUSE OF DEATH LISTED ON DEATH CERTIFICATE?</b> <div style="float: right; margin-top: 10px;"> <input type="checkbox"/> YES <input type="checkbox"/> NO         </div>												

\*Underlying cause refers to the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence which produced the fatal injury.

\*\*Encompasses Discrimination, Interpersonal Racism, and Structural Racism as described on page 4.

**COMMITTEE DETERMINATION OF PREVENTABILITY**

A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

WAS THIS DEATH PREVENTABLE? ☐ YES ☐ NO

CHANCE TO ALTER OUTCOME

☐ GOOD CHANCE

☐ NO CHANCE

☐ SOME CHANCE

☐ UNABLE TO DETERMINE

**CONTRIBUTING FACTORS AND RECOMMENDATIONS FOR ACTION** (Entries may continue to grid on page 5)**CONTRIBUTING FACTORS WORKSHEET**

What were the factors that contributed to this death?  
Multiple contributing factors may be present at each level.

**RECOMMENDATIONS OF THE COMMITTEE**

If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?

DESCRIPTION OF ISSUE (enter a description for EACH contributing factor listed)	CONTRIBUTING FACTORS (choose as many as needed below)	LEVEL	COMMITTEE RECOMMENDATIONS [Who?] should [do what?] [when?] Map recommendations to contributing factors.	LEVEL	PREVENTION TYPE (choose below)	EXPECTED IMPACT (choose below)

**CONTRIBUTING FACTOR KEY  
(DESCRIPTIONS ON PAGE 4)**

- Access/financial
- Adherence
- Assessment
- Chronic disease
- Clinical skill/quality of care
- Communication
- Continuity of care/care coordination
- Cultural/religious
- Delay
- Discrimination
- Environmental
- Equipment/technology
- Interpersonal racism
- Knowledge
- Law Enforcement
- Legal
- Mental health conditions
- Outreach
- Policies/procedures
- Referral
- Social support/isolation
- Structural racism
- Substance use disorder - alcohol, illicit/prescription drugs
- Tobacco use
- Trauma
- Unstable housing
- Violence
- Other

**DEFINITION OF LEVELS**

- **PATIENT/FAMILY:** An individual before, during or after a pregnancy, and their family, internal or external to the household, with influence on the individual
- **PROVIDER:** An individual with training and expertise who provides care, treatment, and/or advice
- **FACILITY:** A physical location where direct care is provided - ranges from small clinics and urgent care centers to hospitals with trauma centers
- **SYSTEM:** Interacting entities that support services before, during, or after a pregnancy - ranges from healthcare systems and payors to public services and programs
- **COMMUNITY:** A grouping based on a shared sense of place or identity - ranges from physical neighborhoods to a community based on common interests and shared circumstances

**PREVENTION TYPE**

- **PRIMARY:** Prevents the contributing factor before it ever occurs
- **SECONDARY:** Reduces the impact of the contributing factor once it has occurred (i.e, treatment)
- **TERTIARY:** Reduces the impact or progression of what has become an ongoing contributing factor (i.e, management of complications)

**EXPECTED IMPACT**

- **SMALL:** Education/counseling (community- and/or provider-based health promotion and education activities)
- **MEDIUM:** Clinical intervention and coordination of care across continuum of well-woman visits (protocols, prescriptions)
- **LARGE:** Long-lasting protective intervention (improve readiness, recognition and response to obstetric emergencies/LARC)
- **EXTRA LARGE:** Change in context (promote environments that support healthy living/ensure available and accessible services)
- **GIANT:** Address social determinants of health (poverty, inequality, etc.)



*From 2017-2019, 185 Missouri children lost their mothers before they turned 1 year old*

*January 23rd is recognized as maternal health awareness day*

*Most pregnancy-related deaths occur between 43 days and 1 year postpartum*

*75% of pregnancy-related deaths are preventable*

*Pregnancy-related death occurs at a higher rate among Black mothers*

*Mental Health Conditions are a leading cause of pregnancy-related death*

*Take a moment today to remember those who lost their mother before they knew her*

*Local community groups can work to help improve maternal health in Missouri.*

**FROM THE MISSOURI  
PREGNANCY-ASSOCIATED  
MORTALITY REVIEW PROGRAM**

**WWW.HEALTH.MO.GOV/PAMR**

**MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES**  
*Pregnancy-Associated Mortality Review*

The program was funded in part by the Missouri Department of Health and Senior Services Title V Maternal and Child Health Program. The program is supported by the state's Medicaid program. The program is also supported by federal funds from the Centers for Disease Control and Prevention. The program is a collaborative effort between the Missouri Department of Health and Senior Services and the Missouri Statewide Pregnancy-Associated Mortality Review Committee. The committee is composed of representatives from the Missouri Department of Health and Senior Services, the Missouri Statewide Pregnancy-Associated Mortality Review Committee, and other stakeholders. The committee's goal is to identify and address the causes of pregnancy-associated mortality in Missouri. The program is a critical component of the state's efforts to improve maternal and child health outcomes. The program is a collaborative effort between the Missouri Department of Health and Senior Services and the Missouri Statewide Pregnancy-Associated Mortality Review Committee. The committee is composed of representatives from the Missouri Department of Health and Senior Services, the Missouri Statewide Pregnancy-Associated Mortality Review Committee, and other stakeholders. The committee's goal is to identify and address the causes of pregnancy-associated mortality in Missouri. The program is a critical component of the state's efforts to improve maternal and child health outcomes.

## Appendix D: Poster Presented at Association of Maternal & Child Health Programs Annual Meeting 2023



### Polysubstance Abuse: A Pervasive Threat to Maternal Health in Missouri

Daniel Quay, MA, Ashlie Otto, RN, Karen Harbert, MPH, Chelsea Fife, BA, LeighAnna Bennett, MPH  
Missouri Department of Health and Senior Services



#### Background and Methodology

Maternal mortality is an internationally-recognized indicator of the overall health of a jurisdiction. In the state of Missouri, this problem is intricately woven with the present opioid abuse epidemic.<sup>1</sup> From 2017-2019, the most common means of fatal injury for pregnancy-associated deaths was overdose/poisoning (41.9%), and substance use disorder (SUD) contributed to 39.5% of all pregnancy-associated deaths. Drug addiction is a tremendous problem for public health in the US,<sup>2</sup> and research has shown that the majority of those with SUD are polysubstance users.<sup>3</sup> This study seeks to provide a better understanding of how maternal death and polysubstance use relate to one another in the state of Missouri.

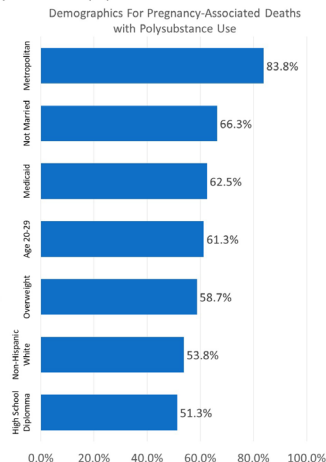
Data comes from the state's Maternal Mortality Review Committee. This multidisciplinary committee performs comprehensive reviews of deaths among Missouri residents who are pregnant at the time of death or within one year of the end of pregnancy. Data are gathered from a variety of sources including medical records, vital records, autopsies, social media histories, and other sources. This provides the context and insight needed for the board to determine pregnancy relatedness and help provide recommendations to prevent similar future deaths. This data represents cases from 2017-2019.

#### Who is Affected by Polysubstance Use

Deaths with evidence of polysubstance use, defined as two or more substances reported in toxicology or UDS screenings, were found across every demographic for all pregnancy-associated deaths. Evidence of polysubstance use was found in 43% of all pregnancy-associated deaths, and 34.6% of pregnancy-related deaths.<sup>4</sup> There were some demographic differences between the maternal death population (n=80) and overdose deaths to women of birthing age with evidence of polysubstance use (n=448), indicating a difference in the way this impacts the pregnancy-associated population.

Pregnancy-Associated deaths with evidence of polysubstance use:

- Most common among Metropolitan residents (83.8%)
  - 84.8% were metropolitan in the birthing-age population
- Most commonly were never married (66.3%)
  - 75.2% were unmarried in the birthing-age population
- Most common among women aged 20 to 29 (61.3%)
  - 21.7% were aged 20 to 29 in the birthing-age population
- Most common among Non-Hispanic White women (53.8%)
  - 77.5% were Non-Hispanic White women in the birthing-age population
- Most common among those with a High School diploma/GED (51.3%)
  - 46.0% had a High School Diploma/GED in the birthing-age population
- Most common with a Medicaid paid birth (62.5%)
- Most commonly considered Overweight/Obese (58.7%)



#### Digging Deeper

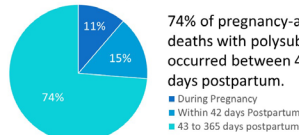
Regarding pregnancy-associated deaths with polysubstance use, opioids were the most common type of substance that appeared (70%). The second most common type of substance were stimulants (including methamphetamines [40%]). Marijuana was present in 23.8% of these deaths.

90.7% of pregnancy-associated overdose/poisoning deaths involved polysubstance use.

- 85.7% involved opioids.
- 34.7% involved stimulants.
- 30.6% involved benzodiazepines.
- 20.4% involved cocaine.

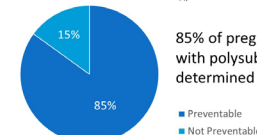
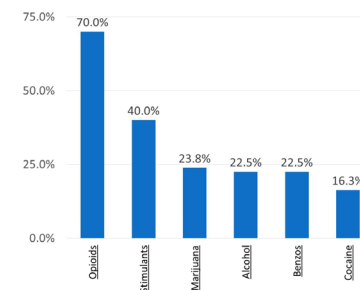
Regarding life stressors in polysubstance use deaths:

- 66.3% had a history of substance use.
- 51.3% had a history of unemployment.
- 43.8% had a history of child protective services involvement.



74% of pregnancy-associated deaths with polysubstance use occurred between 43 and 365 days postpartum.

Substances Used in Pregnancy-Associated Deaths with Evidence of Polysubstance Use



85% of pregnancy-related deaths with polysubstance use were determined to be preventable.

#### Conclusions

Polysubstance use is a public health threat that affects maternal mortality. Though not limited to any specific kind of drug, these deaths are highly correlated with opioid use. This may be partially attributed to drugs, including marijuana, that are laced with substances like fentanyl without the users knowledge. The majority of these deaths showed evidence of a current SUD and a history of prior substance use. The frequency with which these cases experienced a variety of other life stressors helps to highlight engagement opportunities to discuss the dangers of polysubstance use.

#### Public Health Implications

Using MMRC data to enhance our understanding of how polysubstance use affects the birthing population provides insights that will help to prevent similar deaths in the future by identifying opportunities to communicate with the population at greatest risk for this sort of death.

#### Acknowledgements

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\* Pregnancy Associated: when a Missouri resident dies while pregnant, during delivery or within one year postpartum regardless of cause.  
† Pregnancy Related: subset of pregnancy-associated deaths where the death occurred from a pregnancy complication, a chain of events related pregnancy, or the aggravation of an unrelated condition by the physiological effects of pregnancy.

#### Contact

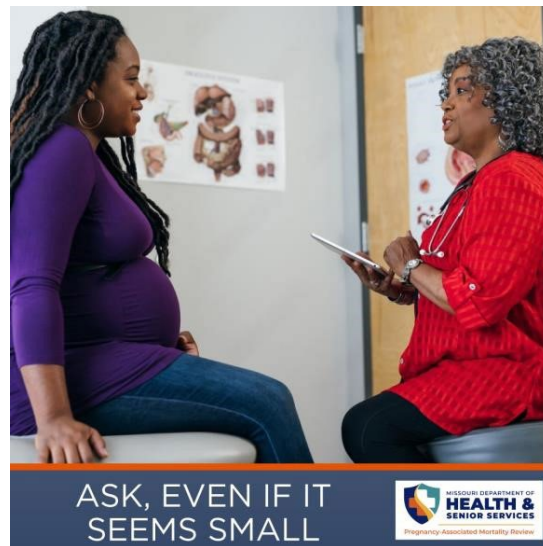
Daniel Quay, MA  
Senior Research Analyst  
Office of Epidemiology  
MO Department of Health and Senior Services  
E-mail: [Daniel.Quay@health.mo.gov](mailto:Daniel.Quay@health.mo.gov)  
Office Telephone: 573-774-6123

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## Appendix E: Maternal Mortality Awareness Campaign

### You Are Not Alone



Being a new mom means putting your baby first, but you must take care of yourself, too. If you feel off in any way, talk to someone! Pregnancy and motherhood can be overwhelming, but friends, family and healthcare providers can help.

### Heart Health in Pregnancy



Pregnancy causes your heart to work extra hard. If you experience symptoms like difficulty breathing, swelling, fainting, fatigue, or persistent cough, speak up! It could save your life and that of your baby.



### Ask for Help



Being a new mom is hard! Most moms experience some form of post-partum depression, ranging from the baby blues to psychosis. If you do not feel like yourself, speak up. You are not alone.

### Stay Safe, Moms



New moms would never dream of leaving a baby unbuckled in the car but often forget to take care of themselves. It is much safer to buckle up during pregnancy and beyond. Make it happen every time you get in a vehicle.